**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
2002/01293

January 23, 2003

Stanley Speaks
Northwest Regional Director
Bureau of Indian Affairs
911 N.E. 11th Avenue
Portland, OR 97232

Re: Endangered Species Act Formal Section 7 Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation, Confederated Tribes of Grand Ronde: 2003-2012 Natural Resources Management Plan, Bureau of Indian Affairs, Yamhill River Basin, Yamhill County, Oregon.

Dear Mr. Speaks:

Enclosed is a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA). The subject of this consultation is the Bureau of Indian Affairs' (BIA) approval the 2003-2012 Natural Resources Management Plan proposed by the Confederated Tribes of Grand Ronde of the Grand Ronde Community of Oregon (CTGR). NOAA Fisheries concludes in this Opinion that the proposed action is not likely to jeopardize the continued existence of listed Upper Willamette steelhead (*Oncorhynchus mykiss*). Pursuant to section 7 of the ESA, NOAA Fisheries has included reasonable and prudent measures with non-discretionary terms and conditions that are necessary and appropriate to minimize the potential for incidental take associated with this project.

In addition, NOAA Fisheries concurs with the BIA's determination that the proposed action is not likely to adversely affect Upper Willamette River Chinook salmon (*O. tshawytscha*).

This Opinion also serves as consultation on essential fish habitat pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and its implementing regulations (50 CFR Part 600).

Please direct any questions regarding this letter to Rob Markle of my staff in the Oregon Habitat Branch at 503.230.5419.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

cc: Kelly Doerksen, CTGR
Dana Shuford, BLM
Bridgette Tuerler, USFWS

Endangered Species Act Section 7 Consultation

# Biological Opinion

and

Magnuson-Stevens Act

# Essential Fish Habitat Consultation

Confederated Tribes of Grand Ronde:
2003-2012 Natural Resources Management Plan
Yamhill River Basin, Yamhill County, Oregon.

| | |
|---|---|
| Agency: | Bureau of Indian Affairs, Northwest Region |
| Consultation Conducted By: | National Marine Fisheries Service, Northwest Region |
| Date Issued: | January 23, 2003 |
| Issued by: | for Michael R Course<br>D. Robert Lohn<br>Regional Administrator |
| **Refer to:** | **2002/01293** |

## TABLE OF CONTENTS

# 1. ENDANGERED SPECIES ACT

## 1.1 Background

The Natural Resources Division of the Confederated Tribes of Grand Ronde of the Grand Ronde Community of Oregon (CTGR) is proposing the adoption of a natural resources management plan (Management Plan) for the years 2003 to 2012 on the CTGR Reservation (Reservation) near Grand Ronde, Oregon. The BIA will authorize the management plan, and the Bureau of Land Management (BLM) will issue a road use permit to haul timber on BLM lands. The BIA is the lead action agency for this consultation.

The proposed Management Plan covers Reservation lands in the South Yamhill River subbasin, which support steelhead listed by the National Marine Fisheries Service (NOAA Fisheries) as threatened under the Federal Endangered Species Act (ESA). Upper Willamette River (UWR) steelhead (*Oncorhynchus mykiss*) were listed as threatened under the ESA on March 25, 1999 (64 FR 14517). Upper Willamette River (UWR) Chinook salmon (*O. tshawytscha*) were listed as threatened under the ESA on March 24, 1999 (64 FR 14308), but do not occur in the action area. Currently, critical habitat is not designated or proposed for either of these species.

NOAA Fisheries received a letter from the BIA requesting formal consultation on the proposed Management Plan under section 7(a)(2) of the ESA on October 29, 2002. Accompanying the letter was a draft biological assessment (BA). NOAA Fisheries received a final BA on November 22, 2002. The BA determined that the Management Plan is likely to adversely affect UWR steelhead and not likely to adversely affect UWR chinook salmon. The BLM provided additional information related to the proposed use of BLM roads to NOAA Fisheries on December 6, 2002.

The objective of this Opinion is to determine whether approval of the proposed Management Plan is likely to jeopardize the continued existence of UWR steelhead, which occur in the proposed project area. Also included is an evaluation of whether NOAA Fisheries agrees that the Management Plan in not likely to adversely affect UWR Chinook salmon. This consultation is conducted pursuant to section 7(a)(2) of the ESA and its implementing regulations, 50 CFR 402.

## 1.2 Proposed Action

The proposed Management Plan establishes guidelines for timber management, road management, stream and riparian management, fish and wildlife enhancement, recreational development, and fire prevention and suppression on the Reservation from January 2003 through December 2012. The Reservation is 10,052 legal acres (9,929 GIS acres). The discrepancy between the acreage is likely a combination of surveyor error and the technical limitations of GIS mapping. The CTGR primarily use the GIS acreage as a management tool. The BIA requested consultation on approval of all activities except fire prevention and suppression, which will be consulted upon separately and are not discussed further in this Opinion. Similarly, other activities included in the Management Plan, but not presented in the BA (*i.e.*, rock quarry development),

will be consulted on individually (J. Baker, CTGR, personal communication via telephone with R. Markle, NOAA Fisheries, December 11, 2002).

The subject activities of this consultation have been described in detail in the BA (Table 1). The purpose of the Management Plan is to "manage the Reservation in a manner that will continue to generate revenue for the Tribe while minimizing and mitigating negative impacts to forest resources."

**Table 1.** Activity descriptions in the BA.

| Management Plan Activity | Biological Assessment | |
|---|---|---|
| Timber Management | Section 6.2 | pages 16-26 |
| Road Management | Section 6.3 | pages 26-31 |
| Stream and Riparian Management | Section 6.4 | pages 31-39 |
| Fish and Wildlife Enhancement | Section 6.5 | pages 39-40 |
| Recreation Development | Section 6.6 | pages 40-41 |

The summary description of the proposed activities that follows was largely taken from the BA submitted by the CTGR. Some issues were clarified during consultation and are cited as personal communications. Riparian and stream management terms used in the BA and in this Opinion have been defined in section 6.4.4 (pages 38 and 39) of the BA.

### 1.2.1 Timber Management

The CTGR propose to complete timber harvest activities on Reservation lands under the Management Plan. Timber management would be divided into two zones. The Standard Timber Management Area (STMA) would be managed for timber production. The second zone, the Coast Creek Special Management Area (CCSMA) would be managed for late-successional forest habitat. The CTGR propose to manage the streams and riparian areas within the two zones under one set of guidelines to protect and enhance aquatic systems.

In accordance with a BIA memorandum of agreement (MOA), the CTGR does not harvest its own timber. The CTGR lays out proposed sales based on the Management Plan guidelines and submits the them for bid. The bid winner enters into a contract with the CTGR that subjects the contractor to the requirements of the Management Plan. CTGR staff are responsible for administering the sale and for verifying that the contractor is in compliance with the Management Plan. The contractor is subject to fines and/or penalties for actions outside the Management Plan guidelines. In 2008, following expiration of the MOA with the BIA, the CTGR may decide to harvest timber in-house rather than through competitive bid. However, the guidelines of the Management Plan would still apply.

Timber management activities in the Management Plan include regeneration (clearcut) harvests, thinning (pre-commercial, commercial, and habitat thinning), and small gap cuts. These activities are discussed below as they pertain to the two management zones.

#### 1.2.1.1 Standard Timber Management Area Activities

The STMA designation applies to all Reservation lands outside of the Coast Creek drainage (Willamina Creek tributary). The STMA is approximately 8,833 GIS acres. Regeneration harvest would be the primary method of harvest. The CTGR would use commercial and pre-commercial thinning to manage timber stands and promote stand development. Timber management objectives include revenue generation, enhancement of tree growth and stand development, and mitigation of timber harvest effects on the environment.

Regeneration Harvest

The CTGR proposes to complete an average of 54 acres of regeneration harvests annually from the STMA (Figure 1, Table 2). The proposed annual harvest ranges from a minimum of 38 acres in 2008 to a maximum of 97 acres in 2003.

An approximate total of 490 acres in the Upper South Yamhill 5th Field Watershed (Appendix A) and 44 acres in the Willamina Creek 5th Field Watershed (Appendix B) are proposed for regeneration harvest over the 10 years of the Management Plan. Four other stands totaling approximately 173 acres would function as alternates (Appendix C). These alternate sites could be selected if the original proposed regeneration units have unforeseen problems such as access, slope instability, environmental concerns, or colonization by a listed species that make harvest undesirable (K. Doerksen, CTGR, personal communication via e-mail with R. Markle, NOAA Fisheries, December 10, 2002).

Regeneration harvests in the STMA would use a 70-year rotation period. The maximum size for regeneration harvest units would be 40 acres. Regeneration harvest units would not be scheduled adjacent to one another until the trees of the previously harvested unit are a minimum height of 5 feet and free to grow. Four to eight green trees would be left per acre of harvest unit for stand structure and wildlife habitat.

Stands younger than 70 years and units larger than 40 acres may be regeneration harvested following CTGR inter-disciplinary team review. The effects of these exceptions were not been evaluated in the BA and are not part of the action as proposed. Exceptions that may effect listed UWR steelhead or UWR Chinook salmon will be consulted upon individually (P. Wakeland, CTGR, personal communication with R. Markle, NOAA Fisheries, November 14, 2002).

**Figure 1.** Annual regeneration harvest proposed by CTGR under Management Plan, 2003-2012 (adapted from BA, Table 8).

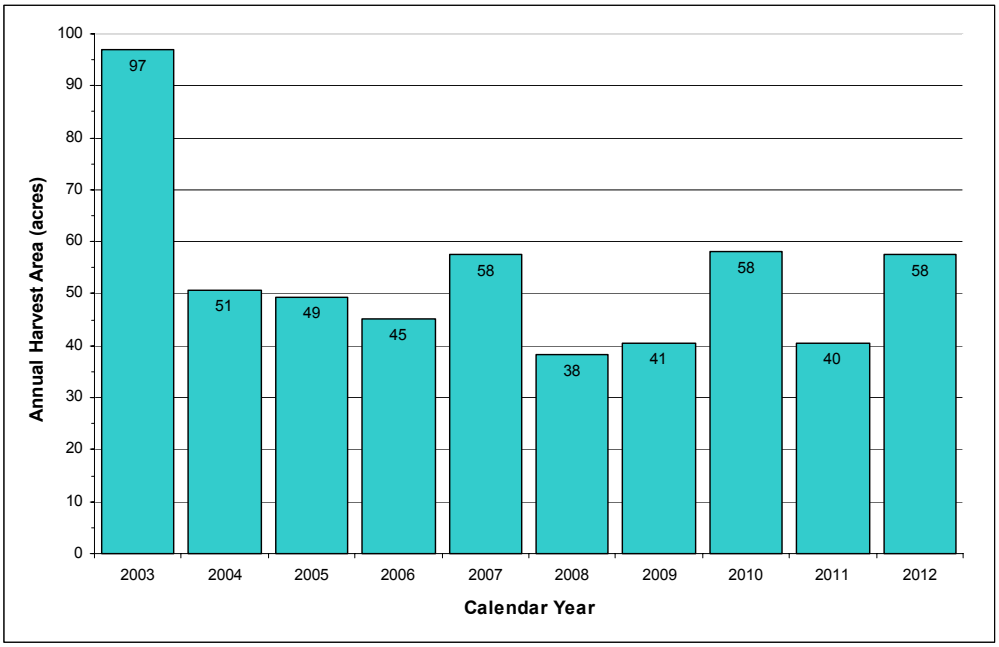


**Table 2.** Timber harvest proposed by the CTGR on Reservation lands, 2003-20012 (adapted from BA, Table 8).

| | Acres | | Estimated Truckloads | |
|---|---|---|---|---|
| Activity | Total | Annual Avg. | Total | Annual Avg. |
| Regeneration Harvest | 535 | 54 | 6,213 | 621 |
| Commercial Thinning | 2,266 | 227 | 6,276 | 628 |
| Habitat Thinning | 521 | 52 | 2,324 | 232 |
| **Total**[1] | 3,321 | 332 | 14,813 | 1,481 |

[1] Due to rounding, figures may not total exactly.

Commercial Thinning

The Reservation contains many forest stands that are approaching or are in an overcrowded condition. Under the Management Plan, these stands may be commercially thinned. Commercial thinning is proposed on approximately 2,266 acres of the STMA during the ten years of the Management Plan, averaging approximately 227 acres per year (Table 2). Commercial thinning objectives were provided in the BA (page 19). Due to the age of the existing stands and the harvest rotation timing, single-entry thinning is anticipated under the Management Plan period, 2003-2012 (K. Doerksen, CTGR, personal communication via e-mail with R. Markle, NOAA Fisheries, December 18, 2002).

The vast majority of stands eligible for thinning are almost exclusively Douglas-fir. The general thinning prescription for this harvest plan would be thinning from below. This means that, generally, the smallest trees with the least amount of crown and the most defects would be cut. This also means that, generally, the largest trees with the most crown and the least defect would remain. The result is an increase in the stand's average tree diameter.

Each commercially-thinned stand would receive an individualized thinning prescription, which is based on the pre- and post-thinning levels of basal area per acre (BA/A), relative density (RD), and quadratic mean diameter (QMD). Each individual prescription would be calculated to maximize the growth response of the stand to the next expected treatment or final harvest, while at the same time keeping the risk of windthrow and breakage at an acceptable level. An example of a typical desired residual target would be (CTGR 2002):

| | |
|---|---|
| Residual BA/A: | Target of 170 (Minimum 162, Maximum 179) |
| Residual QMD: | Minimum 19.0" |
| Residual RD: | Target of 39 (Minimum 37, Maximum 41) |
| Canopy Closure: | Estimated average of 70% |

The CTGR practice variable density thinning, which means that the spacing of the trees that are left (residual tree spacing) varies across the area of the stand. The forest stands to be commercially thinned would be scheduled so that stands with the greatest need (generally the older and more overcrowded stands) would be thinned first.

#### 1.2.1.2 Coast Creek Special Management Area Activities

To provide late-successional forest habitat on the Reservation, regeneration harvest is not proposed by the CTGR in the Coast Creek drainage under the Management Plan. The CCSMA is approximately 1,096 acres and is adjacent to BLM managed lands. The CCSMA would be managed to meet the objectives provided in the BA (page 18).

Activities in the CCSMA would include habitat thinning, small gap cuts, pre-commercial thinning, and interplanting to increase overstory species and structural diversity. No regeneration harvesting would take place during the plan period, although this plan does not preclude future regeneration harvesting in the Coast Creek drainage.

Habitat Thinning

Thinning in the CCSMA is designed to promote older forest characteristics and for the purposes of the Management Plan is termed habitat thinning. Timber stands to be treated in the CCSMA have been selected by using the Old Growth Index (OGI) software in conjunction with Forest Projection System (FPS) software. OGI rates stands according to how well they currently resemble actual old-growth stands. OGI also uses a growth model to determine the rate of development for old-growth characteristics in a stand. Those stands that would receive the most benefit by active management in the next decade have been selected for thinning. An age criterion has not been set for habitat thinning, however, the selected stands would range from 33-

to 112-years old at the time they are thinned. Habitat thinning would occur on approximately 521 acres of the CCSMA with an average harvest of approximately 52 acres per year (Table 2).

Each habitat-thinned stand would receive an individualized thinning prescription, which would be based on OGI analysis and pre- and post-thinning levels of BA/A, RD, and QMD. Desired residual levels of BA/A, RD, and QMD would then be calculated. An acceptable range of residual levels would then be formed around the desired level, to account for natural variability at the stand scale. An example of some desired residual habitat thinning targets are as follows (CTGR 2002):

| | |
|---|---|
| Residual BA/A: | Target of 140 (Minimum 133, Maximum 147) |
| Residual QMD: | Minimum 22.1" |
| Residual RD: | Target of 30 (Minimum 28, Maximum 32) |
| Canopy Closure: | Estimated average of 47.8% |

Habitat thinning would generally be done across all diameter classes in a stand. This means that trees of all diameters, large and small, would be cut. The residual stand would have a diameter distribution approximately equal to that of the stand before thinning. The only difference would be that each residual diameter class would be reduced proportionally with the other diameter classes (*i.e.*, QMD would not appreciably change).

The BA states the reason for this method of thinning is:

> ... that diameter diversity is a key old-growth characteristic. Thinning from below has merits, but it also reduces diameter diversity by removing all trees from the smallest diameter classes. Diameter diversity can also correspond to diversity of the canopy layer. Many wildlife species associated with old-growth benefit from a diverse canopy layer, as opposed to the single canopy layer that results from thinning from below.

Gap Cuts

The CTGR proposes to complete small regeneration harvest areas (gap cuts) within habitat thinning units of the CCSMA. These gap cuts would be less than or equal to five acres, and be replanted with a mix of conifer species to establish new cohorts in the stand. The CTGR's Natural Resource Division (NRD) staff would determine the size and arrangement of the gap cuts, based on slope, aspect, vegetation, the surrounding stand, and operational feasibility. Gap cuts would make up 15% to 25% of the area of the thinned stand.

### 1.2.1.3 Activities Common to Both Management Areas

Pre-commercial Thinning

Under the Management Plan, the CTGR proposes to pre-commercial thin (PCT) trees between the ages of 10 and 20 years. PCT activities would cut small and weaker trees, while retaining a variety of tree species. Spacing would vary between 200 and 300 trees per acre (TPA). Trees cut during PCT would be left on-site.

Yarding

Harvested units would be yarded using either cable yarding or ground-based yarding, depending on site conditions. In general, slopes ≥30% sustained slope would be cable yarded, and slopes <30% would be ground-based yarded. Yarding systems would be designed for the terrain to minimize soil disturbance and compaction.

Approximately 111 acres of the CCSMA may be helicopter-logged in an area that is steep and relatively inaccessible, making conventional logging methods unfeasible. As with all harvest areas, slope stability would be evaluated prior to authorizing thinning in these stands.

Hauling

Under the proposed timber harvests, the CTGR estimate an annual average of 1,481 truck loads of logs would be transported off of the Reservation (Table 2). Specific haul routes were not provided, but likely routes include valley-bottom roads in the Agency Creek (gravel & paved), Yoncalla Creek (gravel & paved), and Cosper Creek (gravel) drainages of the Reservation. The Cosper Creek road is only in the valley bottom for a relatively short stretch before crossing Cosper Creek and ascending the ridge above the Joe Creek drainage as a mid-slope road. Timber hauling would not occur on a natural surfaced valley-bottom road in the Burton Creek drainage (J. Baker, CTGR, personal communication via telephone with R. Markle, NOAA Fisheries, December 11, 2002). In addition, off-Reservation haul routes include valley-bottom roads in the Wind River (gravel) and Coast Creek (gravel) drainages. Other routes are largely on ridgetop roads.

Timber hauling would generally occur during summer and fall. As a general index, if the average annual truck load were applied to only half the year (summer and fall), the average would equate to 8.1 trucks per day. In reality, hauling would be more sporadic with periods of more trucks and periods of no or less trucks, particularly when consider some hauling is likely during the winter and spring seasons too.

The following guidelines for haul routes are included in the CTGR's Forest Practices Ordinance:

> Haul routes shall be closed and/or mitigation measures will be conducted if the road moisture content is so high that unreasonable soil compaction, soil disturbance, or wetland, stream, lake, or pond siltation will be/or is a direct result. Hauling shall be closed when road conditions generate excessive sediment, such as during intense or prolonged rainfall, and when the road surface begins to

> deteriorate as evidenced by the increasing presence of surface mud, rutting, ponding, etc. Mitigation measures include but are not limited to the following: 1) spot rocking and/or re-grading the road, 2) using straw bales or other sediment catching material or devices where sediment may directly enter into a stream, and/or 3) look[*ing*] for opportunities to reroute water/sediment to stable soils. If mitigation measures appear insufficient then hauling shall be closed and remain closed until conditions are improved.

Restrictions on hauling during wet weather would be placed on contractors and written into all timber sale contracts. The CTGR's Forestry Department administers timber sales and would regularly assess hauling conditions.

As part of the haul, three BLM owned road segments (Road 5-7-8.1, Road 5-7-9, and Road 5-7-10) would be used for a portion of the timber harvests proposed under the Management Plan. The CTGR will be required to obtain a road-use permit from the BLM for use of these roads. Road 5-7-8.1 leaves CTGR lands on the Burton Ridge and drops down to Road 5-7-9 via a lateral ridge. Road 5-7-9 is a valley-bottom road that parallels Coast Creek, a steelhead stream. Road 5-7-10, an extension of Road 5-7-9, is outside of the stream influence zone of Coast Creek. That portion of the haul route that is on BLM administered land is approximately 3.6 miles. The distance from the Reservation boundary to pavement is approximately 4 miles, of which approximately 3 miles is along Coast Creek. These roads have gravel travel surfaces that are maintained for all-season use. BLM has the authority to cease hauling when conditions result in sediment delivery to streams and to require the CTGR or the timber purchaser to implement erosion control measures.

Site Preparation and Reforestation

The CTGR propose two alternatives for site preparation after regeneration harvest or gap cuts, *broadcast burning* or *pile and burning*. The method used would depend on when harvest activities are completed. Normally, all regeneration harvest areas that do not require prescribed fire are reforested within one year. If mechanical clearing or prescribed fire is required to prepare the site for planting, reforestation may be delayed beyond one year pending burn prescriptions and smoke management clearance. Slash and brush from gap cuts could be piled and burned or piled without burning (K. Doerksen, CTGR, personal communication via e-mail with R. Markle, NOAA Fisheries, 10 December 2002).

If harvest activities are completed early enough in the season and weather conditions are appropriate, most of the ground with slopes <45% would undergo one pass of brush removal and scarification, and ground >45% slope would be broadcast burned. A shovel yarder using a rake attachment would conduct a single pass over the harvest area to remove competing vegetation and scarify the ground for planting. Competing vegetation would be piled using the grapple arm of the yarder. Brush piles would likely be burned in the fall. These ground preparation activities would be undertaken and completed in the fall in preparation for spring planting.

If harvest activities are not completed by fall, weather and soil conditions could preclude brush removal and piling. If this occurs, fire control lines would be established and the entire unit would be broadcast burned in the spring.

Compaction would be reduced during mechanical clearing by using low ground pressure machines, clearing only when soils are very dry, and rehabilitating by winged sub-soiling any ground based skid trails after clearing.

Under some situations, burning of units may not take place. If conditions are not right for burning, the unit may not be burned and would be reforested the following year according to the regular planting guidelines.

Planting is the primary method of reforestation used on the Reservation Artificial and natural seeding, with the exceptions of red alder and big leaf maple, are not effective or as rapid as planting. Natural regeneration may supplement planting but is not relied on for stocking.

The selection of tree species, planting density (usually 436 trees per acre), and stock types would depend on site characteristics, the composition of the original stand, and projected future management of each stand. Tree species such as Douglas-fir would vary between 85% and 95% of total trees planted. The balance may consist of western hemlock, western redcedar, grand-fir, red alder, and big leaf maple. The hardwood component, such as red alder and big leaf maple, would come into the stand through natural seeding; big leaf maple also is maintained in the stand through stump sprouts.

#### 1.2.1.4 Proposed Conservation Measures

The CTGR has proposed the following conservation measures for timber management activities in both management areas to minimize the threat of adverse affects on UWR steelhead.

1. Yarding.
    a. Cable yarding.
        i. Cable yard in areas ≥30% sustained slope.
        ii. Logs will be fully suspended during yarding.
        iii. Limit yarding corridors to ≤30 feet wide and ≥150 feet spacing (edge to edge distance).
    b. Ground-based yarding.
        i. Ground-base yard in areas <30% slope.
        ii. Use a shovel yarder to minimize soil compaction.
        iii. Design skid trails to occur ≥300 feet apart.
        iv. Use equipment that produces <10 pounds per square inch ground pressure.
        v. Cease yarding when saturated soils exist.
        vi. Minimize soil disturbance and compaction.

2. Hauling.

a. Hauling routes shall be closed and/or mitigation measures will be conducted if the road moisture content is so high that unreasonable soil compaction, soil disturbance, or stream siltation will be/or is a direct result.
b. Hauling shall be closed when road conditions generate excessive sediment.
c. Mitigation measures include rocking, grading, installing sediment traps, and re-routing road drainage to stable slopes.

3. Slope Stability.
   a. All Management Plan lands have been assessed for shallow landslide risk using the SHALSTAB model, and 260 acres have been identified as chronically unstable or at high risk of failure.
      i. These chronically unstable or high risk areas have been withdrawn from harvest and road building pending ground verification.
      ii. Areas that ground verification determines are not at risk of slope failure may be harvested or roads constructed.
   b. All proposed timber sales and road construction will be inspected and evaluated for unidentified landslide risk. Indicators of instability include recent soil movements, pistol-butted trees, leaning trees, planar slopes >80%, concave slopes >65%, slope breaks with a lower slope >70%, and inner gorges with slopes >60%.
   c. All areas, including areas not identified by SHALSTAB, verified to be at risk of slope failure will not be harvested, have harvest operations conducted upon them, or roads constructed.

4. Stream Buffers.
   a. Fish-bearing streams (Type 1), including intermittent fish-bearing streams, shall have a minimum 150-foot no-touch buffer and an outer variable-width buffer that will average 100 feet. The outer buffer may be commercially thinned.
   b. Perennial non-fish bearing streams (Type 2) shall have a 50- to 100-foot no-touch buffer and an additional 0- to 50-foot thinned buffer.
   c. Intermittent non-fish bearing (Type 3) shall have a 25- to 50-foot wide equipment exclusion zone, though tree harvest may occur within this buffer.
   d. Buffers will be measured horizontally from the edge of the bankfull width or channel migration zone, whichever is greater.
   e. No commercial harvest or construction will be allowed in the no-touch buffers. Any trees cut for or damaged by yarding corridors shall be left on site.
   f. Thinning or salvage in outer buffer shall retain a minimum of 25 conifers per acre.

5. Green Trees, Snags, and Down Wood.
   a. At the discretion of the CTGR biologist in consultation with CTGR foresters, green trees may be retained around sensitive habitats to provide protection or additional buffers to harvest activities.

### 1.2.2 Riparian and Stream Management

The CTGR proposes to establish riparian management zones (RMZ) along Reservation streams to protect aquatic resources and habitats. The specific habitat functions that the RMZs were designed to protect are shade, bank stability, woody debris recruitment, leaf litter fall, nutrients, and sediment filtering. Buffer widths would be measured horizontally from the edge of bankfull width or channel migration zone, whichever is greater, and extend upslope to the designated limit.

RMZ Delineation

Three primary zones are proposed based on fish use and stream flow (Table 6). All fish-bearing streams regardless of flow pattern would be designated a Type-1 RMZ. The type-1 RMZ would consist of a 150-foot inner zone with a variable zero to 200-foot outer zone that would average 100 feet. Therefore, the type-1 RMZ would vary from 150 to 350 feet and average 250 feet wide, which equals the site potential tree height for a 200+ year old Douglas-fir (250 feet). The type-2 RMZ (which applies to non-fish bearing perennial streams) is divided into two sub-categories, type-2A and type-2B. The BA includes four questions to be completed to determine which sub-category applies (BA page 34).

1. Is the stream adjacent to the proposed harvest activity within a transition zone and does the stream's hydrology and/or riparian area warrant a larger buffer? The transition zone being the segment of stream directly above the point where fish presence ends that significantly influences the fish bearing waters downstream.

2. Is the slope of the hillsides within 150 feet of the stream, adjacent to the proposed harvest area, greater than 60% for inner gorges, 65% for concave slopes, or 70% for planar slopes?

3. Are the on-site soil types characterized as being highly or extremely erodible and will the harvest activity increase the risk of sediment reaching the adjacent stream?

4. Are there areas of concern within 150 feet of the stream that were identified by a landslide risk model and field verified?

If the answer to all the questions is no, then a type-2A RMZ applies. If the answer to any of the questions is yes, then a type-2B RMZ applies. Type-2A consists of a 50- to 75-foot inner zone and zero to 25-foot variable outer zone that depends on site conditions. Type-2B consists of a 75- to 100-foot inner zone and a variable 25- to 50-foot outer zone.

**Table 3.** Riparian management zones.

| RMZ Type | Fish Use | Stream Flow | Inner Zone (ft) | Outer Zone (ft) | Total Buffer (ft) |
|---|---|---|---|---|---|
| Type 1 | Yes | Perennial | 150 | 0-200 | 150-350 |
| Type 2A | No | Perennial | 50-75 | 0-25 | 50-100 |
| Type 2B | No (use nearby) | Perennial | 75-100 | 25-50 | 100-150 |
| Type 3 | No | Intermittent | NA | NA | 25-50 |

Activities in RMZ

The RMZ designation determines what activities are allowed within those respective zones.

The inner zones of type-1 and type-2 RMZ would have no timber harvest or construction, except operations related to forest roads and riparian/in-stream enhancement and restoration (Table 7). Any trees cut in the inner zone for habitat restoration or enhancement would remain on site, except those cut for road construction, which may be removed or used for aquatic or terrestrial woody debris additions. However, under the Management Plan, the CTGR is proposing only 2 new-road stream crossings, both of which are in type-3 streams. These would be permanent road crossings (K. Doerksen, CTGR, personal communication via e-mail with R. Markle, NOAA Fisheries, December 10, 2002).

No salvage logging would occur within the bankfull width, channel migration zone, or inner type-1 or 2 RMZ, including any portion of trees originating in those areas that may have fallen outside of these zones. Thinning of 10- to 25-year old trees within the inner zone would retain 150 to 300 TPA. Trees within the bankfull width or channel migration zone, and the first two rows of trees outside of stream channels, would not be cut. Thinning of 30- to 90-year old trees would not occur within 50 feet of type-1 streams and within 25 feet of type-2 streams. The thinning target for 30- to 90-year old stands is identical to the CCSMA habitat thinning target, an RD 30 with an estimated canopy closure of 47.8% (K. Doerksen, CTGR, personal communication via e-mail with R. Markle, NOAA Fisheries, December 10, 2002). Gap cuts would not occur within the inner riparian management buffer zones (P. Wakeland, CTGR, personal communication with R. Markle, NOAA Fisheries, November 14, 2002). If a slope break exists, the no-thinning buffer shall extend out to whichever delineation is a greater distance from the stream. Any slumps present within the RMZ would also be included in the no-thin buffer. The slump-based boundary would extend a minimum of 25 feet upslope of the upper most slump edge.

The outer zones of type-1 and type-2 RMZ may be commercially thinned and salvage logged following the guidelines presented in sections 6.4.3.8 (page 37) and 6.4.3.10 (pages 37 and 38) in the BA. The purpose of any harvest taking place in the outer zone would be to achieve habitat enhancement goals. A minimum of 25 TPA would be left after harvest in the outer zone. Retained trees would represent all diameter classes and have variable spacing. Salvage logging

could occur within the outer type-1 and type-2 RMZ when the residual stand would still meet the desired future condition and if downed woody debris (DWD) goals would be met. Salvage of existing down wood within type-3 RMZ could occur when the unremoved balance would meet the DWD requirements.

**Table 4.** Timber management activities allowed within the RMZ.

| | **Type-1 RMZ** | | **Type-2 RMZ** | | |
|---|---|---|---|---|---|
| **Activity** | Inner Zone | Outer Zone | Inner Zone | Outer Zone | **Type-3 RMZ** |
| Commercial thinning | No | Yes | No | Yes | Yes |
| Enhancement thinning | Yes | Yes | Yes | Yes | Yes |
| Salvage logging | No | Yes | No | Yes | Yes |
| Cable yarding across streams | Yes | Yes | Yes | Yes | Yes |
| Ground-based yarding across streams | No | Yes | Yes | Yes | Yes |

If basal area (250 $ft^2$ $ac^{-2}$ at 200+ years of age) or TPA (25 TPA) targets within the outer zone cannot be achieved due the existence of a road within the RMZ, the leave trees would be retained elsewhere within the RMZ or in an adjacent RMZ. If values in the outer zone exceed the target values, these surplus trees may be credited against the obligation to leave trees in the outer zone of other stream RMZ within the same unit provided the number of trees in the outer zone is not reduced to less than 25 TPA.

Cable or aerial yarding through the RMZ may occur, but logs must be fully suspended when crossing water and corridors must not exceed 20% of the stream length associated with the forest practices application. Therefore, if the activity is thinning the outer RMZ along a 200-foot stream reach, the yarding corridor must not create an opening more than a total of 40 feet wide. With certain provisions (see BA page 36), riparian leave trees may be used as tailholds; however, no trees on the edge of bank may be used.

Ground-based yarding in type-2 and type-3 RMZs would be limited to the use of equipment with a ground pressure no greater than 10 pounds per square inch. Any yarding across flowing streams (type-2 or 3) would be on temporary stream crossing structures to maintain streambed integrity and water quality. Temporary crossings would be oriented as close to right angles to the stream as practical. Except in association with stream enhancement projects, no ground-based yarding would occur within the inner type-1 RMZ (K. Doerksen, CTGR, personal communication via e-mail with R. Markle, NOAA Fisheries, December 10, 2002).

Within the RMZ (type 1, 2, or 3), equipment operators must avoid disturbing brush and similar understory vegetation, stumps, root systems, logs embedded in the bed or bank, and leave trees

with root systems embedded in the bank. Any yarding within the RMZ would occur with at least one end suspended from the ground.

### 1.2.3 Road Management

Under the Management Plan roads would be maintained, constructed, and rehabilitated. Road use within the Reservation is for forest management, timber harvest, recreation and fire protection.

#### 1.2.3.1 Road Maintenance

The CTGR propose to maintain existing Reservation roads (approximately 83.8 miles) under the Management Plan (Table 3). In addition to the 74.2 miles of Tribal roads on the Reservation, the BLM and Hampton Tree Farms, Inc. control 3.8 and 5.8 miles of road on the reservation, respectively. Mechanical brushing (removal of brush) and grading would be the most frequent road maintenance activities performed on the Reservation. Typically, road brushing and grading occur in late spring. Most roads would be on a 3-year interval for road brushing. Some high-use roads would be brushed annually. No herbicide use or dust abatement is proposed under the Management Plan (P. Wakeland, CTGR, personal communication with R. Markle, NOAA Fisheries, November 14, 2002).

Roads are categorized into five maintenance classes, each with a separate maintenance schedule (BA pages 30-31).

Maintenance Class 1:
Class 1 roads are mainline roads that are used heavily or frequently for hauling forest products and/or for recreation. They are paved and/or mainline gravel roads that require a high level of maintenance. Maintenance interval: at least once per year. Maintenance includes: Roadside mowing, brush cutting, asphalt patching where needed, grading/spot rocking where needed, checking and cleaning culverts/ditches/catch basins where needed. Gravel roads may require a lift of surface rock every few years (discretionary).

Maintenance Class 2:
Class 2 roads are main access roads, used frequently, but not as frequently as Class 1 roads. They are gravel roads that require a moderate to high level of maintenance. Maintenance interval: every two to three years. Maintenance includes: Brush cutting, grading, spot rocking where needed, pulling ditches, checking and cleaning culverts/catch basins where needed. Gravel roads may require a lift of surface rock every few years (discretionary).

Maintenance Class 3:
Class 3 roads are secondary gravel roads, not frequently used, but necessary to be maintained on a regular basis. They require a moderate level of maintenance. Most Reservation roads fall into this maintenance class. Maintenance interval: every three years. Maintenance includes: Brush cutting, grading/spot rocking where needed, pulling ditches, checking and cleaning culverts/catch basins where needed.

Maintenance Class 4:
Class 4 roads are blocked for all or part of the year, and only need infrequent maintenance to prevent overgrowth of vegetation. These roads receive a minimal level of maintenance. Maintenance interval: every three to five years (discretionary). Maintenance includes: Brush cutting, grading for vegetation removal where needed, checking and cleaning ditches/culverts/catch basins where needed.

Maintenance Class 5:
Class 5 roads are blocked year-round and have been rehabilitated or will not be maintained. Vegetation will be allowed to grow over these roads. Maintenance interval: none, until road is re-opened or re-constructed.

**Table 5.** Maintenance of existing Reservation roads based upon class designation (adapted from BA, Appendix B).

| | Maintenance Class | | | | | |
|---|---|---|---|---|---|---|
| **Travel Surface** | 1 | 2 | 3 | 4 | 5 | **Total** |
| Paved | 4.59 | | | | | 4.59 |
| Gravel | 11.19 | 14.11 | 30.62 | 14.87 | 0.31 | 71.10 |
| Native Surface | | | | | 6.16 | 5.16 |
| 4WD trail | | | | | 2.98 | 2.98 |
| **Total** | **15.78** | **14.11** | **30.62** | **14.87** | **8.45** | **83.83** |

#### 1.2.3.2 Road Construction

The CTGR propose to construct approximately 10 miles of new road under the Management Plan (Table 4). Approximately 5.5 miles of new road would be short-term natural surface roads that will be rehabilitated following harvest, usually within 2 years of construction. Approximately 4.5 miles of new road would be long-term gravel surfaced roads that would remain in use for more than 2 years.

**Table 6.** Proposed road construction under CTGR Management Plan (BA, Table 9).

| Year | Short-term Native Surface (mi) | Long-term Gravel (mi) | Total Miles |
|---|---|---|---|
| 2003 | 1.15 | 0.78 | 1.93 |
| 2004 | 1.72 | 1.62 | 3.34 |
| 2005 | 0.64 | 0.15 | 0.79 |
| 2006 | 0.96 | 0.52 | 1.48 |
| 2007 | 0.33 | 0.35 | 0.68 |
| 2008 | 0.41 | 0.59 | 1.00 |
| 2009 | 0.29 | 0.06 | 0.35 |
| 2010 | 0 | 0.39 | 0.39 |
| 2011 | 0 | 0 | 0 |
| 2012 | 0.05 | 0 | 0.05 |
| **Total** | **5.55** | **4.46** | **10.01** |

The CTGR has proposed the following conservation measures to minimize the risk of new roads contributing sediment to streams.

1. Fit the road to the topography of the area.
2. Avoid locating roads in steep, narrow canyons, slide areas, steep headwalls, slumps, marshes, meadows, riparian areas, or existing drainage channels where practical alternatives exist (*i.e*., preferentially locate roads on stable ridgetops).
3. Avoid locating roads on high-risk areas if practical alternatives exist.
4. Minimize road density in high-risk areas whenever practical alternatives exist and use low-risk construction methods (*e.g*., benching and end-hauling excavated material).
5. Minimize the number of stream crossings.
6. When it is practical, cross streams at right angles to the main channel and leave or re-establish areas of vegetation between roads and streams.

The CTGR offered the following discussion regarding forest road drainage in the BA:

> Adequate forest road drainage is essential in maintaining a stable road and for eliminating or reducing sediment delivery to streams. Roads that cut across forest soils can disrupt the flow of sub-surface water and redirect the flow of water. It is important to restore the flow of water to the soil so that it can be stored and transferred through normal, healthy pathways to streams. When returning water intercepted by roads to natural pathways, it is important to do so in a manner that does not concentrate this water onto fill slopes of roads or into concave draws. Concave draws can concentrate the volume and increase the energy of surface water that can produce destructive effects such as excessive erosion and debris flows.
>
> There are several design factors that can affect how road surface water is returned to natural pathways. These factors are:

- Subgrade shapes - The three types of subgrade shapes commonly used are: crowned with a ditch, out-sloped with no ditch, and in-sloped with no ditch. In-sloping and out-sloping are most often used where stable soils types, like rock outcrops, are crossed and other short segments of road that lead into a full fill section where surface water can be directed onto stable soils. Crowned road subgrades are preferred where long segments of roads and steeper grades are encountered or where frequent channels are crossed necessitating the frequent relief of intercepted surface water.
- Road Grades - Road grades will be kept to between 2% and 18% whenever possible. Flat grades will be avoided, because it is difficult to drain roads that have flat or very nearly flat road grades. A minimum of 2% road grade will be preferred to help keep water out of the road prism, which makes for a more stable roadbed. Steep grades (above about 15%) are avoided, because with steeper slopes comes the need for frequent use of drainage structures to relieve surface water and more frequent road surface maintenance. The damaging effects of erosion can produce road maintenance and siltation problems.
- Drainage Structures - There are many types of drainage structures that can be used to relieve surface water from a road. A properly designed road will provide a drainage system using grade reversals, ditches, culverts, road dips, and/or water bars as necessary to effectively control and disperse surface water to minimize erosion of the road. Water-bars, ditch-relief culverts, and other types of cross-drains will be located where natural filtration through soils and vegetation can take place to dissipate the energy of the water, filter out sediments, and slowly allow water to return to stable soils where it can infiltrate back into the soil and eventually to streams.
- Running Surface Type - Rock surfacing can provide two important functions, if designed properly. First, rock surfacing can spread the load of vehicles over a larger area of the subgrade and prevent rutting. Second, a compacted layer of rock surfacing seals the road surface and sheds surface water, keeping water out of the subgrade, which can cause loss of soil strength and fill failures. Table 10 can be used as an aid in deciding when a road should be rocked and when it should not be rocked.

New road design on the Reservation would follow the CTGR's Forest Practices Ordinance and chapter three (*Forest Road Design*) of the Forest Roads Manual of the Oregon Department of Forestry (ODF) (ODF 2000). Road design and construction guidance is summarized on pages 27 through 30 of the BA, including road surfacing guidelines. The construction of stream crossings would follow the Oregon Road/Stream Crossing Restoration Guide (Robison *et al*. 1999).

#### 1.2.3.3 Road Rehabilitation

The CTGR propose to rehabilitate to vary degrees approximately 14 miles of existing roads on the Reservation under the Management Plan (Table 5). In addition, 5.5 miles of the short-term natural surface road constructed under the Management Plan would be rehabilitated. Natural

surface rehabilitation would include blocking access at road entrance, waterbarring, and seeding, or in some cases planting with trees. In regeneration units, travel surfaces would be ripped using a sub-soiler and replanted with trees.

**Table 7.** Rehabilitation proposed for some existing roads under Management Plan.

| Action | Road length (mi) |
|---|---|
| Rehabilitated | 1.26 |
| Blocked with no maintenance | 6.52 |
| Blocked but maintained | 6.65 |
| **Total** | **14.43** |

### 1.2.4 Fish and Wildlife Enhancement

The CTGR proposes to enhance fish and wildlife habitat under the Management Plan. These activities include creating additional forest meadows, improving fish passage, and riparian and completing in-stream restoration.

The Reservation currently manages 22 acres of forest meadow. The CTGR proposes to clear and remove stumps from an additional 78 acres to create new meadows, usually following the thinning or regeneration harvest of an appropriate area. These meadows would be maintained by mowing or burning. Meadow creation would not occur within RMZs (K. Doerksen, CTGR, personal communication via e-mail with R. Markle, NOAA Fisheries, December 10, 2002).

Identified fish passage barriers (partial and complete) would be eliminated or mitigated to allow passage of adult and juvenile anadromous salmonids. The CTGR propose to follow the Oregon Road/Stream Crossing Restoration Guide (Robison *et al*. 1999) when designing fish passage and the in-water work timing guidelines recommended by the Oregon Department of Fish and Wildlife, which are to allow in-water work from July 1 to October 15 in the Yamhill River basin (ODFW 2000). At this time, only one culvert has been identified for replacement, the Agency/Yoncalla Creek junction culvert on the Agency Creek Road (J. Baker, CTGR, personal communication via telephone with R. Markle, NOAA Fisheries, December 11, 2002).

In addition to the thinning and salvage logging activities previously discussed, the CTGR propose active riparian forest restoration activities, including riparian planting, brush and weed control, placement of in-stream wood and boulders, and bank stabilization. These activities would follow the Oregon Aquatic Habitat Restoration and Enhancement Guide (OPSW 2000, as cited in BA). The CTGR have established a goal of 40 pieces of large wood per mile of stream to provide near-term function until riparian recruitment rates recover sufficiently to naturally provide in-channel wood. Wood additions would include placing logs with a minimum length of 1.5 times the

bankfull width or 50 feet, and key pieces would have a minimum diameter of 24 inches. Small corridors may be constructed to allow equipment to place wood or boulders stream channels.

### 1.2.5 Recreation Management

The Management Plan includes the creation, enhancement, and maintenance of recreational opportunities.

Approximately 3.9 miles of existing hiking trails would be maintained using hand powered tools with occasional use of chainsaws to remove fallen timber from path. Maintenance activities generally occur during summer. All trails are restricted to non-motorized travel. Three recreation areas (Agency Creek Day Park, Burton Pond, and Yoncalla Falls) totaling 78.4 acres would be maintained.

The Management Plan calls for the construction of a 0.2 acre campground in the Agency Creek area with 12-15 campsites, vault toilets, trash facilities and service, and hand-pumped well water. A 1,400-foot gravel road would provide access from the main Agency Creek road (400 to 404 road). The access road and campground would be outside of the RMZ (K. Doerksen, CTGR, personal communication via e-mail with R. Markle, NOAA Fisheries, 10 December 2002). Erosion control measures during construction would prevent sediment transport to Agency Creek or West Agency Creek (J. Baker, CTGR, personal communication via telephone with R. Markle, NOAA Fisheries, 11 December 2002).

The CTGR propose to restore 3.8 miles of the historic Tillamook Trail in the Agency Creek drainage. With an approximately 2- to 3-foot wide natural surface, the trail would connect Agency Creek Day Park and the proposed campground with the Siuslaw National Forest. The trail would run along the west side of Agency Creek for approximately one mile with the remainder on ridgetops. All stream crossings would be by pedestrian bridge, except West Fork Agency Creek, which is crossed via an existing culvert. Design criteria call for placing the trail on stable ground, away from stream banks, and out of the channel migration zone of the Agency Creek mainstem. Following construction of the Tillamook Trail, the CTGR would have 7.7 total miles of trail to maintain on the Reservation (J. Baker, CTGR, personal communication via telephone with R. Markle, NOAA Fisheries, December 11, 2002).

## 1.3 Biological Information

Although there are currently limited data to assess population numbers or trends, steelhead stocks in the UWR steelhead evolutionarily significant unit (ESU) likely are depressed relative to past abundance. The status and relevant biological information concerning UWR steelhead are well described in the proposed and final rules from the Federal Register (63 FR 11798, March 10, 1998; and 64 FR 14517, March 25, 1999, respectively), and Busby *et al.* (1995,1996).

UWR steelhead are a late-run winter steelhead. Hatchery fish are widespread throughout the region. Both summer steelhead and early-run winter steelhead have been introduced to the basin

and escape to spawn naturally in substantial numbers. Winter steelhead are in steep decline after exhibiting wildly fluctuating abundance. Recent average adult abundance has been estimated at 3,000 fish. Natural fish adult returns in 1995 were the lowest in 30 years. Declines have been recorded in almost all natural populations. Natural steelhead integrity is at risk from introduced summer steelhead.

According to the BA, there is little to no data on the historic steelhead population in the action area. The CTGR provided the results of recent surveys in the BA:

> Fish surveys conducted by the Tribe [*CTGR*] in 1996 and 2000 documented natural steelhead reproduction in Agency Creek. In 2002, the Tribe [*CTGR*] operated a smolt trap on Agency Creek from March 16 through May 10 and captured 10 steelhead smolts. No steelhead were recaptured to make a population estimate. However, if the season recapture rate for coho smolts is applied to steelhead smolt[*s*], the results would be an estimate of 127 steelhead smolts migrating downstream, assuming the capture rate for steelhead and coho are equal.

It is not known whether the existing steelhead population is a dwindling remnant of the discontinued state stocking program or the legacy of a historical native run. The CTGR have identified steelhead habitat on the Reservation in Agency Creek, Coast Creek, and Burton Creek. Steelhead may use other streams on the Reservation too.

Upstream spawning migration of winter steelhead begins in March and April, and peak spawning occurs from April through June. Adult steelhead use the South Fork of the Yamhill River as a migratory corridor and spawn in the upper reaches. Fry emerge from the gravel in late spring/early summer and rear in the stream for 1 or 2 years. Juveniles outmigrate and begin smoltification during spring run-off.

The relationship between anadromous and non-anadromous (rainbow trout) *O. mykiss* in this geographic area is unclear. Non-anadromous *O. mykiss* are known to occupy the Upper Willamette River basin; however, mostly above natural and manmade barriers (Kotow 1995, as cited in Busby *et al*. 1996). Due to introductions of non-native steelhead stocks and transplantation of native stocks within the basin, the present distribution of native Upper Willamette River basin steelhead, and their relationship to non-anadromous and possibly residualized *O. mykiss* within the basin, are unclear (Busby *et al.* 1996).

UWR Chinook salmon currently are not found in the Yamhill River watershed. However, juvenile UWR Chinook salmon may use the lower portion of the Yamhill River, over 40 stream miles downstream of the Reservation.

## 1.4 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA (50 CFR 402). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species. This analysis involves the initial steps of defining the biological requirements and current status of the listed species, and evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of mortality attributable to: (1) Collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmonid's life stages that occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize the listed species, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

For the proposed action, NOAA Fisheries' jeopardy analysis considers direct or indirect effects on fish attributable to the action. NOAA Fisheries considers the extent to w`ich the proposed action impairs the function of essential habitat elements necessary for juvenile and adult migration, spawning, and rearing of UWR steelhead under the existing environmental baseline.

### 1.4.1 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying the ESA to listed species is to define the biological requirements of the species most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list UWR steelhead for ESA protection and also considers new data available that are relevant to the determination.

The relevant biological requirements are those necessary for UWR steelhead to survive and recover to naturally-reproducing population levels at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environmental.

For actions that affect freshwater habitat, NOAA Fisheries usually describes the habitat portion of a species' biological requirements in terms of a concept called properly functioning condition (PFC). PFC is defined as the sustained presence of natural habitat-forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation (NOAA Fisheries 1999). PFC, then, constitutes the fresh-water habitat component of a species' biological requirements.

For this consultation, the biological requirements are improved habitat characteristics that function to support successful migration, spawning, holding, and rearing. The current status of the UWR steelhead, based upon their risk of extinction, has not significantly improved since the species was listed.

### 1.4.2 Environmental Baseline

The environmental baseline is an analysis of the effects of past and on-going human and natural factors leading to the current status of the species or its habitat and ecosystem within the action area. The action area is defined as all areas (bankline, adjacent riparian zone, and aquatic area) to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). Direct effects occur at the project site and may extend upstream or downstream based on the potential for impairing fish passage, hydraulics, sediment and pollutant discharge, and the extent of riparian habitat modifications. Indirect affects may occur throughout the watershed where actions described in this Opinion lead to additional activities or affect ecological functions contributing to stream degradation. For this consultation, the action area includes all Reservation lands (10,052 acres, or 15.7 $mi^2$) and associated waterways, and those reaches of streams downstream of the Reservation that may experience water quality (*e.g.*, water temperature, turbidity) changes resulting from the proposed action.

#### 1.4.2.1 Factors Affecting Species' Environment Within the Action Area

Land ownership in the northern portion of the South Yamhill watershed (which includes Eads Creek, Agency Creek, Yoncalla Creek, Wind River, Joe Creek and Cosper Creek) consists of 12.2% Federal, 16.2% Tribal, 0.2% state of Oregon, 24.7% private, and 46.6% private industrial land (BLM 1998, as cited in CTGR 2000). Land ownership in the Willamina Creek watershed (which includes Coast Creek, Burton Creek, and Canada Creek) consists of 31.5% Federal, 3.8% Tribal, 0.7% state of Oregon, 0.5% municipal, 24.4% private, and 39.1% private industrial land (BLM 1998, as cited in CTGR 2000).

Forestry is the dominant land use in both the South Yamhill and Willamina Creek watersheds, especially in the upper drainages. Forests in both watersheds are fragmented and relatively young. Douglas-fir dominates forested areas, with western red cedar and western hemlock occurring less commonly. Red alder is widespread and dominates some riparian and disturbed areas. The lower watersheds are dominated by agriculture, rural residential, and the communities of Grand Ronde and Willamina.

According to a BLM watershed analysis (BLM 1998, as cited in BA), many streams in these two watersheds, particularly in lower reaches, have been degraded by past practices including usage of splash dams, road construction along streams, and clearcutting adjacent to streams. The analysis states:

> Streams often lack deep pools, large wood and off channel areas needed for fish habitat. Water quality in the watersheds has been affected in the past by

> unregulated development of residential areas, road construction, clearcutting, and farming. Quality in the streams tends to decrease as streams flow toward the valley and the type and amount of activities that impact water quality increase. Problems with sedimentation, contaminated runoff, low oxygen levels and water temperature occur in many lower portions of the watersheds (BLM 1998, as cited in BA).

Willamina Creek from the mouth to above East Creek at river mile 10 and the South Yamhill River upstream from the confluence with Willamina Creek are listed on the Clean Water Act 303(d) list by the Oregon Department of Environmental Quality (ODEQ) for exceeding the fecal coliform standard (ODEQ1998, as cited in the BA).

In completing its analysis of effects, NOAA Fisheries typically considers effects of the proposed action on the status of essential environmental factors comprising properly functioning watersheds. These factors are organized in a matrix of pathways and indicators (MPI) in table 1 of NOAA Fisheries (1996a). NOAA Fisheries relies on these pathways and indicators because (1) they are relevant to the survival and recovery of the fresh-water life stages of Pacific salmon, (2) habitat data often is more readily available than fish population data such as egg-to-smolt survival or growth rates, and (3) they are affected by land management activities. Using the procedures in NOAA Fisheries (1996a) as a guide, action agencies can evaluate available data to describe environmental baseline conditions as properly functioning, at risk, or not properly functioning, report potential effects of proposed actions on baseline conditions, and determine whether proposed actions are likely or not likely to adversely affect listed species or critical habitat.

The environmental baseline descriptions in the BA are accompanied by detailed narrative descriptions of the baseline for each habitat indicator in each subwatershed in the action area. The environmental baseline in the South Yamhill River and Willamina Creek watersheds is dominated by conditions rated as functioning at risk or not properly functioning (see Table 17 in BA).

Based on the information described above, the environmental baseline does not currently meet all of the biological requirements for the survival and recovery of listed UWR steelhead trout within the action area. Restoration of properly functioning watersheds is necessary to achieve aquatic conditions and processes that will be sufficient to meet the needs of the species for survival and recovery. Actions that retard or prevent attainment of properly functioning watersheds would not be consistent with the needs of the listed species for survival and recovery.

## 1.5 Analysis of Effects

The CTGR determined whether each activity is expected to restore, maintain, or degrade aquatic habitat indicators as described in NOAA Fisheries (1996a). If any of the indicators was predicted to be degraded by an activity, the CTGR determined that activity to be likely to adversely affect the listed species (Table 8). The turbidity indicator was errantly left unmarked for ground-based

yarding in the BA (J. Baker, CTGR, personal communication via telephone with R. Markle, NOAA Fisheries, 11 December 2002), and has been added in Table 8 below.

**Table 8.** Effects of proposed activities on habitat indicators (adapted from BA, Table 17).

| | Timber Mgmt | | | Roads | | | Riparian Mgmt | | | | Fish | Rec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indicator | Ground-based Yarding | Timber Hauling | Site Prep | New Roads | Road Maintenance | Road Rehabilitation | Inner RMZ Thinning | Outer RMZ Thinning | RMZ Cable Yarding | RMZ Ground Yarding | Fish Passage | Campground |
| Temperature | | | | | | | X | | | | | |
| Turbidity | X | X | X | X | X | X | | | | | X | X |
| Substrate | X | X | X | X | X | X | | | | | | |
| Large Woody Material | | | | | | | X | X | | | | |
| Pool Area | X | | X | X | X | X | | | | | | |
| Pool Quality | X | X | X | X | X | X | | | | | | |
| Stream Influence Zone | | | | | | | | | X | X | | |

### 1.5.1 Effects of Timber Management

Logging operations have the potential to adversely affect upland and riparian ecological functions and characteristics that shape aquatic habitat (Gregory *et al*. 1987, Chamberlin *et al*.1991). These functions and characteristics include provision of shade and cover, nutrient processing, food web support, sediment routing and composition, stream channel form, bank stability, water quality, flow timing and volume, and linkages to the floodplain (Sullivan *et al*. 1987, Gregory *et al*. 1991, Spence *et al*. 1996).

Log yarding and subsequent prescribed burning activities can increase soil exposure, runoff, and surface erosion (Chamberlin *et al*. 1991). The magnitude of effects depends on the degree of disturbance, slope, soil types, the time required for revegetation, and whether runoff can be concentrated by roads or other features.

Increases in sediment supply beyond the transport capability of the stream can cause stream channel instability, aggradation, widening, loss of pools, and a reduction in gravel quality (Sullivan *et al*. 1987, Swanston 1991). For salmon, these changes can mean reduced spawning

success when spawning areas are covered, eggs and fry are buried, food abundance is reduced, and over-wintering habitat is lost (Hicks *et al*. 1991).

Large woody material (LWM) is an important component of freshwater salmonid habitat. LWM regulates sediment and flow routing, influences stream channel complexity and stability, and provides hydraulic refugia and cover within stream systems (Bisson *et al*. 1987, Gregory *et al*. 1987, Hicks *et al*. 1991, Sedell and Beschta 1991). LWM also plays a key role in retaining salmon carcasses (Cederholm and Peterson 1985), a major source of nitrogen and carbon in stream ecosystems (Bilby *et al*. 1996). Forest management activities within a distance equal to one-site potential tree height of streams have the potential to change the distribution, size, and abundance of LWM that is recruited from adjacent riparian areas and hill slopes (Hicks *et al*. 1991, Ralph *et al*. 1994, Murphy 1995, Spence *et al*. 1996).

Logging within a distance equal to the height of a site-potential tree of a stream has the potential to affect LWM recruitment from the streamside stand (FEMAT 1993, Spence *et al*. 1996). However, because LWM recruitment potential declines rapidly moving away from the stream, a buffer of 100 feet includes about 80-98% of streamside LWM recruitment potential, depending on stand age and other factors (McDade *et al*. 1990, Van Sickle and Gregory 1990). Additional wood can be recruited to fish-bearing streams from upslope and upstream areas through landslides and debris flows (McGarry 1994, Reeves *et al*. 1995). In some areas, wood transported in this manner may constitute up to 50% of the wood recruited to downstream reaches (McGarry 1994). McDade *et al*. (1990) could not account for 48% of the existing LWM pieces in a study of recruitment from streamside areas.

Stream shade (important for controlling water temperature) can be affected by logging within a distance equal to approximately three-quarters of a site potential tree height (FEMAT 1993, Spence *et al*. 1996). For small streams, the riparian buffer width needed to provide 75-90% shade varies widely, from 30-145 feet (Beschta *et al*. 1987). The majority of litterfall (a source of nutrients to the stream) is provided by vegetation within a distance equal to one-half to three-quarters of a site potential tree height (FEMAT 1993). Bank stability can be affected by removing trees in the zone where roots can extend to the stream bank (Beschta 1991) (up to approximately 30 feet from the stream for mature conifer trees, or wider where there is a channel migration zone).

Headwater streams play an important role in watershed function by storing and routing sediment, and providing high quality water, LWM, organic litter, and dissolved nutrients into the lower gradient fish-bearing streams (Sullivan *et al*. 1987, Murphy 1995, Spence *et al*. 1996). LWM in headwater streams increases sediment retention by forming depositional areas and dissipating energy; retains non-woody organic matter, allowing it to be biologically processed prior to downstream export as dissolved and particulate nutrients; and delays surface water passage, allowing it to be cooled by mixing with ground water (Bisson *et al*. 1987).

Recently-logged areas often experience an increased rate of landslides (Swanston and Swanson 1976, Sidle *et al*. 1985, Swanston 1991, ODF 1999). A likely reason for this increase is altered

soil shear strength. Soil shear strength decreases as tree roots gradually decay over a period of 2-10 years (Ziemer 1981, Sidle *et al*. 1985). Landslides originating from harvested hillslopes, and that travel along harvested stream channels, will deliver primarily sediment rather than LWM to streams (Hicks *et al*. 1991, Reeves *et al*. 1995). The rate and composition of landslides (Reeves *et al*. 1995), channel gradient and tributary junction angle (Benda and Cundy 1990), and the presence of mature trees in runout zones that can reduce debris flow runout distance (ODF 1999) are major factors determining effects of these events on fish habitat.

Under the Management Plan, the CTGR propose to harvest timber on 3,321 acres of the 10,052 acre Reservation over a 10-year period (Table 2). Regeneration harvests (535 acres) will be temporally and spatially distributed (Table 9). Only one regeneration unit (8.9 acres) is adjacent to known steelhead habitat with an additional eight units (145.7 total acres) adjacent to potential steelhead habitat. Units proposed for commercial or habitat thinning are spread across the reservation with numerous units adjacent to known or potential steelhead habitat. Habitat thinning will open up the canopy more than commercial thinning, but vegetation retained in the RMZs (Appendices A, B, & C) is likely to minimize effects of upland harvest on temperature and LWM. Riparian harvest effects are discussed later in this Opinion under *Effects of Riparian and Stream Management*.

**Table 9.** Temporal and spatial distribution of regeneration harvests.

| | | Harvest Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Field Watershed | Drainage | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Upper S. Yamhill | Eads | | | | | | | | | sh (9.1) | |
| | Agency | | | SH (8.9) | | | | | | | |
| | Yoncalla | | | | | | | | | | |
| | Cosper | sh (33.2) | | | sh (19.1) | | sh (38.2) | | | | |
| | Wind | | | | sh (10.9) | | | | | | |
| | Joe | | | | | | | | | | |
| Willamina | Burton | | | | | | | | | | |
| | Canada | | | sh (35.2) | | | | | | | |

SH: Unit adjacent to known steelhead habitat (harvest acres). sh: Unit adjacent to potential steelhead habitat (harvest acres).

The CTGR indicated that ground-based yarding, timber hauling, and site preparation are likely to degrade (short-term) the turbidity, substrate, pool area, and pool quality indicators. NOAA Fisheries believes that harvests adjacent to type-3 streams are likely to decrease delivery of LWM to streams from in debris flows and may deliver sediment to downstream fish habitat where stream gradients are high and channel roughness elements (*e.g*., LWM) are inadequate to retain fine sediment.

The layout of the proposed harvest units avoids most areas predicted by SHALSTAB to have high or medium risk of landslides (BA, Figure 15) or steep slopes (BA, Figure 16). Based on the maps provided in the BA, regeneration units in the Eads Creek (58170136, 58170373, 58170167), Yoncalla Creek (58030279, 58150252), and Canada Creek (47300336) drainages appear to contain or occur adjacent to high/medium risk sites or steep slopes. Of these six units, three units appear to have the possibility of contributing material to potential steelhead habitat (58170136,

58170373, and 47300336). The project design criteria (PDC) call for field verification and avoidance of unstable slopes, and retention of riparian vegetation.

For type-1 and type-2B perennial streams, the proposed RMZs fully provide the riparian functions of bank stability, shade, and litterfall, and LWM recruitment, and likely will provide all or nearly all of the sediment filtration function expected from a mature conifer forest (FEMAT 1993, Murphy 1995, Spence *et al*. 1996). The CTGR's yarding requirements and oversight will help minimize sediment generation from the harvests. Although timber harvest may cause minor reductions in shade and LWM recruitment in type-2A streams, NOAA Fisheries expects PDCs will adequately minimize adverse effects on listed species from regeneration and thinning harvests in non-riparian areas, including risks of mass wasting if strictly implemented.

### 1.5.2 Effects of Riparian and Stream Management

The CTGR determined that activities conducted under the riparian and stream management category are likely to degrade (short-term) temperature, large woody debris, and stream influence indicators (Table 9). These activities were inner RMZ thinning, outer RMZ thinning, RMZ cable yarding, and RMZ ground-based yarding. The general effects of activities in this category are related to habitat management and enhancement activities presented in section 1.5.1 and section 1.5.4 of this Opinion.

Inner RMZ thinning may reduce stands to a range of 150 to 300 TPA. The CTGR has indicated that inner RMZ thinning may replicate habitat thinning conducted in the CCSMA with habitat thinning targets of RD 30 and 47.8% canopy closure. No-cut buffers of 50 and 25 feet for type-1 and type-2 streams, respectively, combined with the partial tree retention in the outer RMZ, should minimize decreases in channel shade, though not avoid them entirely. Since small streams have a greater proportion of surface area than larger streams, they may be at greater risk from increases in solar radiation (Chamberlin *et al*. 1991). On the other hand, small streams are more likely to be shaded by shrubs and small trees that grow back relatively quickly. Although the CTGR has not described any limitations on inner RMZ thinning area or the length of stream reach treated, NOAA Fisheries does not expect thinning to be extensive because there is no financial incentive to fell trees in these areas. Since the no-cut buffers would include streambanks and CMZs, NOAA Fisheries expects the buffers to avoid adverse affects to bank stability, litter fall, and floodplain function. All trees felled in the inner RMZ must remain on site and would not be sold or removed, except as noted at road crossings; therefore, inner RMZ LWM should be beneficially affected.

Thinning may also decrease near-term (*e.g.*, over 10-50 years) functional wood recruitment, particularly in small streams where existing trees are of adequate size to form pools (Beechie *et al.* 2000). However, silviculturists frequently indicate thinning trees younger than 80-years of age likely will accelerate tree growth and the recruitment of larger sized wood. Many reaches of Reservation streams are deficient in wood. CTGR's goal of 40 pieces of wood per stream mile, which will be implemented under the fish and wildlife enhancement category, should ameliorate any reduction in functional wood recruitment until recruitment of large diameter trees

commences. Furthermore, since trees thinned in the inner RMZ remain on site, the felling of any additional trees into channels as fish enhancement projects of sufficient diameter to provide channel function may also help compensate for any effects to recruitment.

Activities within the RMZ will not include regeneration harvests or gap cuts. Cable and ground-based yarding in the inner RMZ may reduce stream-side vegetation where corridors are created. PDCs that limit the width, spacing, and extent of corridors in the RMZ will minimize shade reduction and the risk of water temperature elevation. Ground-based yarding in the inner RMZ is limited to the implementation of fish enhancement projects (*e.g.*, placement of in-channel large wood).

NOAA Fisheries generally agrees with the CTGR's evaluation of likely effects of riparian and stream management; however, harvests adjacent to type-3 streams may cause sediment delivery to downstream fish habitat if stream gradients are high and in-channel structures (*e.g.*, woody debris) inadequate to retain fine sediment.

### 1.5.3 Effects of Road Management

Construction of a road network can greatly accelerate erosion rates in a watershed (Haupt 1959, Swanson and Dyrness 1975, Swanston and Swanson 1976, Beschta 1978, Gardner 1979). Cederholm *et al*. (1981) reported that the percentage of fine sediments in spawning gravels increased above natural levels when more than 2.5% of a basin area was covered by roads. Unpaved road surfaces continually erode fine sediments, adding significant amounts of sediment to streams (Reid and Dunne 1984, Swanston 1991). Roads and related ditch networks are often connected to streams, providing a direct conduit for sediment. On steep hills, road construction or improper maintenance can greatly increase landslide rates relative to undisturbed forest (Swanson and Dryness 1975, Swanston and Swanson 1976, Furniss *et al*. 1991, ODF 1999), delivering large pulses of sediment to streams. Increased sediment delivery can adversely modify stream channel morphology by filling pools and interstitial spaces used for salmonid holding and rearing, covering spawning gravels, and causing streams to become wider and shallower (Hicks *et al*. 1991, Furniss *et al.* 1991). Roads built near watercourses can eliminate part of the riparian vegetation (Furniss *et al.* 1991), reducing LWM recruitment and shade. Riparian roads also constrain the natural migration of the stream channel where channel migration zones are present.

Road networks can intercept, divert, and concentrate surface and subsurface water flows, thereby increasing the watershed's drainage network (Hauge *et al*. 1979, Furniss *et al.* 1991, Wemple *et al*. 1996). This can change peak and base stream flows and increase landslide rates. Stream crossings can restrict channel geometry and prevent or interfere with migration of adult and juvenile anadromous fish (Furniss *et al*. 1991). Crossings can also be a source of sedimentation, especially if they fail or become plugged with debris (Furniss *et al.* 1991, Murphy 1995).

According to the Management Plan, 14.43 miles of road would be rehabilitated over a 10-year period. However, only 1.26 miles of the 14.43 miles to be rehabilitated involves more than road closing, which means a net increase of 8.75 miles of road on the Reservation (10.01 mi

constructed - 1.26 mi fully rehabilitated = 8.75 mi of new road). Therefore, effectively the existing road density of 5.3 miles per square mile (mi $mi^{-2}$) (83.83 road mi 10,052 $ac^{-2}$), which is rated at not properly functioning under NOAA Fisheries (1996a), will increase to 5.9 mi $mi^{-2}$ (92.58 mi / 10,052 ac).

Although road density can be a useful indicator of landscape-scale disturbance, specific information on road location, design, use and maintenance is helpful to determining effects of particular actions. Under the proposed action, where possible, new roads will be located along ridge-tops, outside of landslide-prone areas. Roads will be designed so that stream crossings are minimized, reducing erosion problems resulting from culvert fills and concentration of road drainage onto potentially unstable areas. Proposed roads would be relocated or re-engineered if unstable slopes or other unfavorable conditions are found during road design or construction.

Directing surface runoff away from unstable sidecast or fill material, reestablishing natural drainage patterns where possible, and executing follow-up inspections and corrections are important for successful road treatment programs (Harr and Nichols 1993). Spur roads would be water-barred, scarified and planted with grass at the completion of the proposed action, which reduces sediment generation. Cross drain spacing under ODF road design guidelines (ODF 2000) may be insufficient. ODF recently proposed amending its forest practice rules to include the following[1]: "Where needed to protect water quality, as directed by the State Forester, operators shall place additional cross drainage structures on existing active roads within operation areas as per the requirements of OAR 629-625-330." Montgomery (1994) described simple procedures for determining required frequency of road drainage features (based on road drainage area and hill slope) needed to avoid concentration of runoff onto areas in a manner that could cause channel initiation and landslides.

The CTGR indicated that road-related activities (new roads, road maintenance, and road rehabilitation) conducted under the Management Plan are likely to degrade (short-term) turbidity, substrate, pool area, and pool quality indicators (Table 9). NOAA Fisheries agrees with this evaluation.

### 1.5.4 Effects of Fish and Wildlife Enhancement

The CTGR determined that activities conducted under the fish and wildlife enhancement category of the proposed Management Plan are likely to degrade (short-term) the turbidity indicator (Table 9). These activities were related to culvert replacement projects intended to improve fish passage. NOAA Fisheries agrees with this evaluation of effects.

Riparian vegetation can be disturbed when access roads are constructed or trees are pulled over or cut to provide instream structures. As stated previously reductions in riparian vegetation can reduce channel shading and increase water temperatures, reduce litterfall, and reduce streambank

[1]Oregon Secretary of State, Notice of Proposed Rulemaking Hearing, Oregon Department of Forestry, Protection Division, Administrative Rules Chapter Number 629, Salem, Oregon, April 24, 2002.

stability. The proposed PDCs (*e.g.*, minimize stream entry points, minimum no-cut buffers) should minimize adverse effects to riparian functions.

Instream restoration structures (*e.g.*, placement of large wood and/or boulders in a stream) could help reduce width/depth ratios and increase pool frequency, which could result in water temperature reductions.

Sediment delivery to the stream channel could result from the construction of restoration access roads, some types of structure placement, culvert replacement, and hauling materials to the site over native surface roads. Stream sediment loads can also increase for several years after the project is completed until a stream channel adjusts to its original form and vegetation has been established. However, NOAA Fisheries expects the proposed PDCs to limit sediment sources and design failures.

Chemical contamination of the stream channel could occur from equipment leaks (diesel fuel, oil, hydraulic fluids, and antifreezes) or refueling during project implementation.

Existing culverts may be removed and replaced with new structures or removed without replacement in order to restore fish passage at locations that were previously barriers to adult and/or juvenile fish movements.

Placement of large wood can create more complex fish habitat. The stability or longevity of this wood within streams is strongly linked to its size, orientation to flow within the stream, channel dimensions, watershed area upstream from the structure, and the percentage of the log that is in the active stream channel. The PDCs require the use of whole trees or tree pieces that are of sufficient size to mimic natural accumulations in a given stream.

Potential benefits resulting from culvert removal/replacement include better access for fish and other aquatic organisms and better routing of flood flows and associated bedload.

### 1.5.5 Effects of Recreation Management

The CTGR indicated that activities conducted under the recreation management category of the proposed Management Plan are likely to degrade (short-term) the turbidity indicator (Table 9). The CTGR thought construction of the Agency Creek campground would be the most likely contributor of sediment to area waterways under this category. NOAA Fisheries agrees with this evaluation of effects, although PDCs related to the construction of the campground (e.g., outside of the RMZ, erosion control) should minimize the risk of sediment reaching area streams. A more likely source of sediment under the Recreation category is stormwater runoff from trails within the RMZ.

Clearing brush along trails and in recreation sites along streams has the potential to cut riparian vegetation that contributes to streambank stability and stream shade, and provides organic material to streams. Brushing and felling hazard trees in riparian areas could increase solar

radiation to streams. Past experience of the CTGR with trail and recreation site maintenance suggests that only a few hazard trees would be cut per year at any one site or trail. Therefore, effects to water temperature should be negligible since removal of hazard trees would be localized and not enough trees would be removed to significantly reduce stream shade.

Aquatic habitats could be affected by trail maintenance due to sediment delivery associated with removal of material from small landslides and trail tread repair. Trail tread maintenance may cause localized, short-term increases in sediment yield when rocks or roots are removed. Removal of landslide material may also generate sediment. The potential for sediment input to streams is dependent on the amount of ground disturbance at the site level, soil type and compaction, distance from the stream, slope steepness, vegetation present, and distance to nearest occupied habitat. Some sediment may be delivered to Reservation waterways from existing hiking trails and 4WD trails, but construction of the proposed Tillamook Trail likely will have minimal effect on aquatic resources due to trial alignment and stream crossing design criteria.

NOAA Fisheries expects recreation site maintenance to produce only minimal amounts of sediment. Grading and resurfacing of graveled roads in recreation areas and the campground may produce sediment. However, it is unlikely that sediment would affect aquatic habitats since riparian buffers would filter most sediment before reaching streams.

Spills may occur during routine trail and recreation site maintenance. Spills may include fuel, oil, cleaning materials, or human waste associated with equipment and the pumping of toilets.

Trail and recreation site maintenance could affect local instream wood abundance and piece size by creating smaller, more mobile pieces when blowdown trees and hazard trees are cut to allow passage along streamside trails.

### 1.5.6 Cumulative Effects

Cumulative effects under the ESA are defined in 50 CFR 402.02 as those effects of "future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being (or have been) reviewed through separate section 7 consultation processes. Therefore, these actions are not considered cumulative to the proposed action.

NOAA Fisheries is not aware of any specific future non-Federal activities within the action area that would cause greater impacts to listed species than presently occurs. However, some adjacent lands are in private timber production. Chemical fertilizers or pesticides likely are used on these lands, but no specific information is available regarding their use. Furthermore, NOAA Fisheries does not consider the rules governing timber harvests on non-Federal lands within Oregon to be sufficiently protective of watershed, riparian, and stream habitat functions. Therefore, these habitat functions likely are at risk due to future harvests on non-Federal forest lands within the basin.

### 1.5.7 Landscape-Scale Effects

This section considers potential landscape-scale or cumulative effects (as defined in the Council of Environmental Quality's regulations implementing the procedural provisions of the National Environmental Policy Act) of the Management Plan's proposed timber harvests (regeneration and non-riparian thinning) in the Upper South Yamhill River and Willamina Creek watersheds. The increased watershed disturbance from these harvests has the potential to increase landscape-scale effects arising from existing watershed problems with forest fragmentation, LWM, substrate, off-channel habitat, pool frequency and quality, stream influence zone, and physical barriers.

A possible landscape-scale effect related to increased forest fragmentation from the regeneration harvests and road construction is increased volume of peak flows and altered peak flow timing (Jones and Grant 1996). These effects often are most pronounced in the rain-on-snow zone (Christner and Harr 1982, Harr 1986). However, rain-on-snow events are rare in this area (only once since 1964), and significant hydrologic effects resulting from increased forest fragmentation due to these harvests are unlikely. Also, Thomas and Megahan (1998) reanalyzed Jones' and Grants' (1996) data and found conclusive increases for peak flows only in small watersheds. Thomas and Megahan (1998) concluded that peak flow increases resulting from clearcut harvests were not detectable for flows with greater than 2-year return intervals (*i.e.* effects were detectable only for small storms). The ecological significance of peak flow increases for small storm events is not known.

Landscape-scale effects in the form of short-term increases in sediment yield are likely to accrue due to the combined effects of road construction and use, harvest, yarding, and burning activities proposed (Chamberlin *et al.* 1991, Reid and Dunne 1984).

## 1.6 Conclusion

NOAA Fisheries has determined that, based on the available scientific and commercial data, approval of the Management Plan of the CTGR is not likely to jeopardize the continued existence of UWR steelhead. In arriving at this determination, NOAA Fisheries considered the current status of the listed and proposed species, biological requirements for survival and recovery, environmental baseline conditions, the effects of the action, and the cumulative effects of actions anticipated in the action area. A short-term increase in sediment yield is likely from timber harvest, yarding, road use, site preparation, road construction, road maintenance, and road rehabilitation activities in the sales. The Reservation road network is likely to constitute an ongoing low-level sediment source to area streams. Riparian thinning, riparian yarding, and fish enhancement access corridors are likely to reduce channel shading and LWM recruitment in localized stream reaches. However, conservation measures proposed by the CTGR will sufficiently ensure that adverse effects are likely to be short term and local, and that long-term deterioration of the listed species' habitat will not occur. These measures include:

1. Preferentially locating new road segments along ridge-tops and designing roads so that stream crossings are minimized.

2. Stream buffers that would reduce the likelihood of adverse effects on bank stability, shade, litterfall, sediment filtration, and LWM recruitment functions based on characteristics of the local drainage and distribution of the listed species.
3. Measuring buffers horizontally from the edge of the bankfull width or channel migration zone, whichever is greater.
4. Any timber inadvertently felled in the designated stream buffers will be left in the buffer.
5. Avoidance of timber harvest on sites with a high risk of slope failure.
6. Equipment and yarding restrictions that will minimize soil compaction and erosion.
7. Cessation of log hauling and active erosion control when sediment delivery to streams is likely.
8. Construction of Agency Creek Campground in an upland site.
9. Aligning the Tillamook Trail away from stream banks and minimizing stream crossings.

NOAA Fisheries concurs with the BIA's determination that the Management Plan is not likely to adversely affect UWR Chinook salmon for the previously stated reasons and because Chinook salmon occur no closer than approximately 40 miles downstream of the action area.

In recognition of the Federal Government's trust responsibilities to Indian tribes, particularly as addressed in the Secretarial Order (Secretaries of Commerce and Interior) issued on June 5, 1997, NOAA Fisheries gives deference to tribal resource management plans when considering activities that affect natural resources under NOAA Fisheries' purview. This must be considered when NOAA Fisheries conducts its analyses and draws its conclusions regarding tribal natural resource management activities.

## 1.7 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are *discretionary* measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of critical habitat, or to develop additional information.

NOAA Fisheries believes the following conservation recommendations are consistent with these obligations, and therefore should be implemented by the BIA. The BIA should encourage CTGR to complete these actions:

- Follow the procedures described by Montgomery (1994) for determining the frequency of road drainage features needed to avoid concentration of runoff onto areas in a manner that could cause channel initiation and landslides.
- Retain trees along type-3 streams, especially those that can deliver sediment to steelhead-bearing streams through debris flows. Procedures in Benda and Cundy (1990) can be used to help identify sediment-delivery streams.
- Reduce forest road density on the Reservation.

- Continue their stream surveys and their ongoing inventories of riparian and upland vegetation.
- Begin surveys to identify UWR steelhead spawning locations and times. This should be done on a trial basis first, in cooperation with NOAA Fisheries, to develop methods that will not result in an unauthorized "take" of this listed species.
- Survey their existing road system to identify potential flow alteration, erosion, and mass failure problems, and unneeded road segments, and to identify possible opportunities for restoration work.
- Develop an effectiveness monitoring program to determine the effectiveness of the CTGR's riparian and upland strategies for maintaining and restoring fish habitat.

In order for NOAA Fisheries to be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed species or their habitat, NOAA Fisheries requests notification of the implementation of any conservation recommendations.

### 1.8 Reinitiation of Consultation

This concludes formal consultation on these actions in accordance with 50 CFR 402.14(b)(1). The BIA must reinitiate consultation if: (1) The amount or extent of incidental take is exceeded; (2) the action is modified in a way that causes an effect on the listed species that was not previously considered in the biological assessment and this Opinion; (3) new information or project monitoring reveals effects of the action that may affect the listed species in a way not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16). In instances where the amount or extent of authorized incidental take is exceeded, any operations causing such take must cease pending conclusion of the reinitiated consultation. If the CTGR fails to provide specified monitoring information by the required date, NOAA Fisheries may consider that a modification of the action that causes the Incidental Take Statement of this Opinion to expire.

## 2. INCIDENTAL TAKE STATEMENT

Section 9 and rules promulgated under section 4(d) of the ESA prohibit the take of endangered species and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Harm is further defined by NOAA Fisheries to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, and sheltering (50 CFR 217.12). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered to be a prohibited taking under the ESA provided that such taking is in compliance with the term and conditions of this incidental take statement.

## 2.1 Amount or Extent of Take

NOAA Fisheries anticipates that the proposed action covered by this Opinion is reasonably certain to cause incidental take of adult and juvenile UWR steelhead in the form of sublethal injury or behavior modifications, and to a lesser degree, mortality, predominately due to increased sediment delivery to area streams. Additional direct injury or mortality may result from the placement of in-channel wood or boulders, and indirect injury may result from elevated water temperature and reductions in near-term (10-50 years) large wood recruitment. Effects of actions such as these are largely unquantifiable in the short term. The effects of these activities on population levels are also largely unquantifiable and likely are not measurable in the long term.

Therefore, even though NOAA Fisheries expects some low level of incidental take may occur due to the action covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NOAA Fisheries to estimate a specific amount of incidental take to the species itself. In instances such as this, NOAA Fisheries designates the expected level of take in terms of the extent of take allowed. Therefore, NOAA Fisheries limits the extent of allowable incidental take of UWR steelhead to take resulting from the action as proposed that occurs in any Reservation stream extending from the upstream extent of activities to 1 mile downstream of the Reservation boundary. Incidental take occurring beyond these areas (*i.e.*, >1 mile downstream of the Reservation) is not authorized by this consultation.

## 2.2 Reasonable and Prudent Measures

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to minimizing take of UWR steelhead:

1. Minimize incidental take from Management Plan activities by implementing activities as presented to NOAA Fisheries.

2. Minimize the likelihood of incidental take resulting from adverse effects to water quality associated with the proposed Management Plan activities.

3. Minimize the likelihood of incidental take resulting from the alteration of aquatic and riparian habitat.

4. To ensure that activities are completed as described in the BA and in this Opinion, and that the protective measures are effective, provide and implement a monitoring plan for the proposed activities.

## 2.3 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the BIA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure # 1 (implementation), the BIA shall ensure that:
   a. Implementation. Each activity is implemented as described in the BA (summarized in this Opinion as section 1.2)
   b. In-stream projects. A professional fisheries biologist is involved in the design of all in-stream projects. Ensure that knowledgeable and trained personnel (*e.g.*, fisheries biologist, hydrologist, and/or engineer) participate in the implementation of all in-stream projects.
   c. Activities not included. The following activities were not included in this consultation, and would require individual consultations.
      i. Construction of new roads and stream crossings within type-1 and type-2 RMZ.
      ii. Bank stabilization activities below the ordinary high-water (OHW) elevation, other than activities associated with culvert removal or replacement.
      iii. Use of chemical herbicides, pesticides, fertilizers, and dust abatement.
      iv. Timber hauling on natural surfaced, valley-bottom segments of the Burton Creek road.
      v. Existing or proposed permanent water withdrawals.
      vi. Use of cable to anchor in-stream structures (natural fiber rope is authorized).
      vii. Use of baffles in culverts to provide fish passage.

2. To implement reasonable and prudent measure # 2 (water quality), the BIA shall ensure that:
   a. RMZ work timing. Activities within the RMZ that are likely to deliver sediment to UWR steelhead habitat due to site-specific conditions (*e.g.*, insufficient stream structure to retain fine sediments, steep slope or stream gradient, or lack of vegetative ground cover) are conducted between July 1 and October 15 of a given year.
   b. RMZ thinning. Inner RMZ thinning will not occur to such an extent that water temperature is elevated in stream reaches accessible to ESA-listed fish.
   c. Landslides. Roads are not located on areas with a high risk of slope failure that may contribute sediment to steelhead habitat.
   d. Ditch cleaning. Disturbance of existing vegetation in ditches and at stream crossings is minimized to the greatest extent possible.
   e. Timing of in-water work. Work within active stream channels is completed between July 1 and October 15 of a given year. Exceptions must receive NOAA Fisheries' concurrence in writing prior to work being performed.
   f. Cross drains. Cross drains are designed and placed to discharge onto stable slopes.
   g. Hauling. Timber hauling is avoided when road conditions would generate excessive sediment, such as during intense or prolonged rainfall, or when the road surface begins to deteriorate as evidenced by the increasing presence of surface mud, rutting, ponding, etc.

h. Erosion control.
   i. Erosion control measures are implemented to minimize sediment delivery sources (*e.g.*, rock check dams, silt fence, hay bales).
   ii. Disturbed soils within 50 feet of type-1 and 25 feet of type-2 streams are planted with native grass seed.

i. Heavy Equipment. Equipment must be fueled, operated, maintained and stored as follows.
   i. Vehicle staging, cleaning, maintenance, refueling, and fuel storage must take place 150-feet or more from any stream, water body or wetland.
   ii. All vehicles operated within 150-feet of any stream, water body or wetland must be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected must be repaired 150-feet or more from any stream, water body or wetland before the vehicle resumes operation.
   iii. The use of equipment in streams shall be minimized.
   iv. All equipment operated instream must be cleaned before beginning operations below the bankfull elevation to remove all external oil, grease, dirt, and mud.

j. Material disposal. Landslide and excavated waste materials are disposed of in stable, non-floodplain sites. Provide erosion control to minimize sediment delivery to streams.

k. Access points. The number and length of stream access points through riparian areas are minimized.

l. Trails. Erosion from trails are prevented and minimized by designing and maintaining proper drainage structures with adequate spacing of waterbars especially before stream crossings.

m. Water withdrawals. Water withdrawals completed in association with the proposed action (*e.g.*, dust abatement, prescribe fire control) meet the following conditions:
   i. Only temporary, limited time period per day (*i.e.*, 4 hours) water withdrawals are authorized.
   ii. Preferentially select non-fish bearing sources when available.
   iii. Have a fish screen installed, operated and maintained in accordance to NOAA Fisheries' fish screen criteria (NOAA Fisheries 1995, 1996b) (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm) on any intake structure used in waters potentially containing steelhead, including:
      (1) Ensure adequate velocity distribution by using internal baffling for the screens.
      (2) Screen material openings for fish less than 60 mm (1.75 mm for woven wire or 3/32 in for perforated plate).

      With the following acceptable variances:
      (3) Limit approach velocities to less than 0.2 fps.
      (4) The requirement of an automatic screen cleaning system is waived if pump intake is removed between uses or at a minimum is cleaned daily.

iv. Do not pump from streams that do not have continuous surface flow or that will result in adverse water quantity or quality conditions in steelhead habitat.

3. To implement reasonable and prudent measure # 3 (habitat alteration), the BIA shall ensure that:
   a. Stream crossing design.
      i. The CTGR follow NOAA Fisheries' guidelines for stream crossing design and installation (available at http://swr.nmfs.noaa.gov/hcd/NMFSSCG.pdf).
      ii. Stream crossings are designed to pass a 100-year peak flood. Culverts shall pass the 100-year peak flood without exceeding the top of the culvert inlet (headwater/diameter ratio less than one). Hydraulic capacity must compensate for expected deposition in the culvert bottom.
      iii. Stream-crossing structures replaced on fish-bearing streams consist of one of the following options: a clear-span bridge, bottomless arch culvert, embedded culvert, or no-slope culvert.
      iv. No new stream crossings occur within 300-feet upstream of any known or suspected steelhead spawning area if the spawning area may be affected. Does not preclude repair or replacement of existing stream crossing structures meeting the standards provided elsewhere in this Opinion.
      v. Vehicles and machinery cross riparian areas and streams at right angles to the main channel wherever possible.
   b. Large wood. All large wood is retained within the stream channel system during culvert cleaning activities.
   c. Boulders. Large boulders are placed only in streams where they occur naturally as a habitat component. Boulder placement is for stream habitat restoration, not bank stabilization.

4. To implement reasonable and prudent measure # 4 (monitoring), the BIA shall ensure that:
   a. Monitoring plan.
      i. A monitoring plan is developed that includes, at a minimum all of the following:
         (1) Post-sale measurement of riparian buffer widths at representative locations in each harvest unit, including thinning units.
         (2) An inspection for excessive damage to soil, vegetation, streambanks, or stream channels from felling, yarding corridors, soil compaction, roads, scarring, or prescribed burning.
      ii. The monitoring plan is developed and submitted to NOAA Fisheries within 60 days of the date of the final Opinion.
   b. Monitoring report.
      i. Monitoring results for all Management Plan activities conducted within a calendar year are submitted to NOAA Fisheries by March 1 of the

succeeding year. Exceptions must receive NOAA Fisheries' agreement in writing prior to the due date.

ii. Monitoring reports will be submitted to:

National Marine Fisheries Service
Oregon Habitat Branch
Reference: F/NWR/2002/01293
525 NE Oregon Street, Suite 500
Portland, OR 97232

iii. Within 30 days of receipt of the annual monitoring report, CTGR NRD staff will work with NOAA Fisheries to schedule a meeting to review the submitted report and conduct site visits. The need for such a meeting will be at NOAA Fisheries' discretion.

iv. Failure to provide timely monitoring reports causes the Incidental Take Statement to expire. If the CTGR fails to provide specified monitoring information by the required date, NOAA Fisheries may consider that a modification of the action that causes an effect on listed species not previously considered and cause the Incidental Take Statement to expire.

v. If a dead, sick or injured UWR steelhead is located, immediate notification must be made to Rob Markle, NOAA Fisheries, telephone: (503-230-5419), or NOAA Fisheries Law Enforcement (360-418-4246). Care will be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured species or preservation of biological material from a dead animal, the finder has the responsibility to carry out instruction provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

## 3. ESSENTIAL FISH HABITAT CONSULTATION

### 3.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2)).

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A)).
- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g*., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

## 3.2 Identification of Essential Fish Habitat

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: Chinook salmon (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the *Pacific Coast Salmon Plan* (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

## 3.3 Proposed Actions

The proposed action and action area are detailed above in section 1.2 of this Opinion. The action area includes habitats that have been designated as EFH for various life-history stages of coho salmon.

## 3.4 Effects of Proposed Action

As described in detail in section 1.5 of this Opinion, the proposed action may result in short- and long-term adverse effects to a variety of habitat parameters. These adverse effects are:

1. Sediment delivery to streams will adversely affect water quality and substrate.
2. Sediment delivery to streams may reduce pool area volume and frequency.
3. Thinning within the riparian zone may reduce stream shade, increase water temperatures and decrease near-term (10-50 years) wood recruitment to streams.
4. Harvest along type-3 streams may reduce wood recruitment from debris flows into salmon-bearing streams.

## 3.5 Conclusion

NOAA Fisheries concludes that the proposed action will adversely affect designated EFH for coho salmon.

## 3.6 EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions that may adversely affect EFH. Although NOAA Fisheries assumes that the conservation measures described in the biological assessment will be implemented by the BIA, these measures likely are not sufficient to address the adverse impacts to EFH described above. However, the conservation recommendations outlined in section 1.7 and the terms and conditions outlined in section 2.3 are generally applicable to designated EFH for coho salmon, and address these adverse effects. Consequently, NOAA Fisheries recommends that they be adopted as EFH conservation measures.

## 3.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR 600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

## 3.8 Supplemental Consultation

The BIA must reinitiate EFH consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(k)).

## 4. LITERATURE CITED


Beechie, T.J., G. Pess, P. Kennard, R.E. Bilby, and S. Bolton. 2000. Modeling recovery rates and pathways for woody debris recruitment in northwestern Washington streams. North American Journal of Fisheries Management 20:436-452.

Benda, L. and T. Cundy. 1990. Predicting deposition of debris flows in mountain channels. Canadian Geotechnical Journal 27(4):409-417.

Beschta, R.L. 1978. Long-term patterns of sediment production following road construction and logging in the Oregon Coast Range. Water Resources Research 14:1011-1016.

Beschta, R.L. 1991. Stream habitat management for fish in the northwestern United States: the role of riparian vegetation. Am. Fish. Soc. Symp. 10:53-58.

Beschta, R.L., R.E. Bilby, G.W. Brown, [and others]. 1987. Stream temperature and aquatic habitat: fisheries and forestry interactions. In E.O. Salo and T.W. Cundy, eds. Streamside management: forestry and fishery interactions. University of Washington, Institute of Forest Resources, Seattle. Contribution 57. p. 191-232.

Bilby, R.E., B.R. Franson, and P.A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Can. J. Fish. Aquat. Sci. 50:164-173.

Bisson, P.A., R.E. Bilby, M.D. Bryant, C.A. Dolloff, G. B. Grette, R.A. House, M.L. Murphy, K.V. Koski, and J.R. Sedell. 1987. Large woody debris in forested streams in the Pacific Northwest: past, present, and future. Pages 143-190 in E.O. Salo and T.W. Cundy, editors. Streamside management: forestry and fishery interactions. Contribution No. 57. Institute of Forest Resources, University of Washington, Seattle.

BLM (Bureau of Land Management). 1998. Deer Creek, Panther Creek, Willamina Creek and the South Yamhill Watershed Analysis, 1998. Tillamook Resource Area, Salem District, Bureau of Land Management, Tillamook, OR.

Busby, P., S. Grabowski, R. Iwamoto, C. Mahnken, G. Matthews, M. Schiewe, T. Wainwright, R. Waples, J. Williams, C. Wingert, and R. Reisenbichler. 1995. Review of the status of steelhead (*Oncorhynchus mykiss*) from Washington, Idaho, Oregon, and California under the U.S. Endangered Species Act. 102 p. plus 3 appendices.

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-27, 261 p.

Cederholm, C.J., L.M. Reid, and E.O. Salo. 1981. Cumulative effects of logging road sediment on salmonid populations in the Clearwater River, Jefferson County, Washington. In Proceedings, Conference on Salmon Spawning Gravel: a Renewable Resource in the Pacific Northwest? Pgs 38-74. Water Research Center Report 39, Washington State University. Pullman, WA.

Cederholm, C.J., and N.P. Peterson. 1985. The retention of coho salmon (Oncorhynchus kisutch) carcasses by organic debris in small streams. Can. J. Fish. Aquat. Sci. 42:1222-1225.

Chamberlin, T.W., R.D. Harr, and F.H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. In Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats; W.R. Meehan, ed. Pgs. 181-206. American Fisheries Society Special Pub. 19. Bethesda, MD.

Christner, J., and R.D. Harr. 1982. Peak streamflows from the transient snow zone, western Cascades, Oregon. Paper presented at the Western Snow Conference, April 20, 1982, Reno, Nevada.

CTGR (Confederated Tribes of Grand Ronde). 2000. Biological assessment for year 2000 timber sales. Confederated Tribes of Grand Ronde, Natural Resource Division. p. 63+.

CTGR (Confederated Tribes of Grand Ronde). 2002. Addendum to the biological assessment for the Confederated Tribes of Grand Ronde 2003-2012 Natural Resources Management Plan - US Fish and Wildlife Service. Confederated Tribes of Grand Ronde, Natural Resource Division. p. 5.

FEMAT (Forest Ecosystem Management Assessment Team). 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. U.S. Government Printing Office 1993-793-071. U.S. Government Printing Office for the U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Land Management, and National Park Service; U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service; and the U.S. Environmental Protection Agency.

Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road construction and maintenance. In Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats; W.R. Meehan, ed. Pgs. 297-324. American Fisheries Society Special Pub. 19. Bethesda, MD.

Gardner, R.B. 1979. Some environmental and economic effects of alternative forest road designs. Transactions of the American Society of Agricultural Engineers 22:63-68.

Gregory, S.V., G.A. Lambertti, D.C. Erman, [and others]. 1987. Influence of forest practices on aquatic production. In Streamside Management: Forestry and Fishery Interactions; E.O. Salo and T.W. Cundy, eds. Pgs. 233-256. Contribution 57, University of Washington, Institute of Forest Resources. Seattle, WA.

Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummins. 1991. An ecosystem perspective of riparian zones. BioScience Vol. 41, No. 8, pp 540-551.

Harr, R.D. 1986. Effects of clear cutting on rain-on-snow runoff in western Oregon: a new look at old studies. Water Resour. Res. 22: 1095-1100.

Harr, R.D. and R.A. Nichols. 1993. Stabilizing forest roads to help restore fish habitats: A northwest Washington example. Fisheries 18(4):18-22.

Hauge, C.J., M.J. Furniss, and F.D. Euphrat. 1979. Soil erosion in California's coast forest district. California Geology (June):120-129.

Haupt, H.F. 1959. Road and slope characteristics affecting sediment movement from logging roads. Journal of Forestry 57:329-332.

Hicks, B.J., J.D. Hall, P.A. Bisson, and J.R. Sedell. 1991. Responses of salmonids to habitat changes. In Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats; W.R. Meehan, ed. Pgs. 297-324. American Fisheries Society Special Pub. 19. Bethesda, MD.

Jones, J.A. and G.E. Grant. 1996. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. Water Resources Research 32(4):959-974.

McDade, M.H., F.J. Swanson, W.A. McKee [and others]. 1990. Source distances for coarse woody debris entering small stream in western Oregon and Washington. Canadian Journal of Forest Research 20:326-330.

McGarry, E.V. 1994. A quantitative analysis and description of the delivery and distribution of large woody debris in Cummins Creek, Oregon. Oregon State University, Corvallis Oregon. M.S. Thesis.

Montgomery, D.R. 1994. Road surface drainage, channel initiation, and slope stability. Water Resources Research 30:1925-1932.

Murphy, M.L. 1995. Forestry impacts on freshwater habitat of anadromous salmonids in the Pacific Northwest and Alaska -- requirements for protection and restoration. NOAA Coastal Ocean Program Decision Analysis Series No. 7. NOAA Coastal Ocean Office, Silver Spring, MD. 156 pp.

NOAA Fisheries (National Marine Fisheries Service). 1995. Juvenile fish screen criteria. Environmental & Technical Services Division, Portland, Oregon. Revised February 16. (Available on-line at: http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm).

NOAA Fisheries (National Marine Fisheries Service). 1996a. Making Endangered Species Act Determinations of Effect for Individual or Groups Actions at the Watershed Scale. National Marine Fisheries Service Environmental and Technical Services Division, Portland, Oregon. August, 1996. (Available on-line at: http://www.nwr.noaa.gov/1habcon/habweb/habpub.htm) 22p. plus appendices.

NOAA Fisheries (National Marine Fisheries Service). 1996b. Addendum, juvenile fish screen criteria for pump intakes. Environmental & Technical Services Division, Portland, Oregon. May 9. (Available on-line at: http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm).

ODEQ (Oregon Department of Environmental Quality). 1998. Oregon's approved 1998 section 303(d) list of water quality limited waterbodies.

ODF (Oregon Department of Forestry). 1999. Storm impacts and landslides of 1996: Final Report. Forest Practices Technical Report Number 4. Salem, Oregon.

ODF (Oregon Department of Forestry). 2000. Forest Roads Manual. Available at: http://www.odf.state.or.us/DIVISIONS/management/state_forests/roadsman.asp?id=3040110.

ODFW (Oregon Department of Fish and Game). 2000. Oregon guidelines for timing of in-water work to protect fish and wildlife resources. Available at: http://www.dfw.state.or.us/hcd/timing/timing.html.

OPSW (Oregon Plan For Salmon and Watersheds). 1999. Oregon Aquatic Habitat Restoration and Enhancement Guide, May 1999. Available at: http://www.oregon-plan.org/.

PFMC (Pacific Fishery Management Council). 1999. Amendment 14 to the Pacific Coast Salmon Plan - Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Portland, Oregon.

Ralph, S.C., G.C. Poole, L.L. Conquest, R.J. Naiman. 1994. Stream channel morphology and woody debris in logged and unlogged basins of western Washington. Can. J. Fish. Aquat. Sci. 51:37-51.

Reeves, G.H., L.E. Benda, K.M. Burnett, [and others]. 1995. A disturbance-based approach to maintaining and restoring freshwater habitats of evolutionarily significant units of anadromous salmonids in the Pacific Northwest. American Fisheries Society Symposium 17:334-349.

Reid, L.M., and T. Dunne. 1984. Sediment production from forest road surfaces. Water Resources Research 20:1753-1761.

Robison, G.E., A. Mirati, and M. Allen. 1999. Oregon Road/Stream Crossing Restoration Guide: Spring 1999. Oregon Department of Forestry and Oregon Department of Fish and Wildlife.

Sedell, J.R., and R.L. Beschta. 1991. Bringing back the "bio" in bioengineering. In Fisheries Bioengineering: Proceedings of a Symposium, Bethesda, MD; J. Colt and S. Dendall, eds. Pgs. 160-175. American Fisheries Society Publication 10. Bethesda, MD.

Sidle, R.C., A.J. Pearce, and C.L. O'Loughlin. 1985. Hillslope stability and land use. American Geophysical Union Water Resources Monograph 11.

Spence, B.C. G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, OR.

Sullivan, K., T.E. Lisle, C.A. Dolloff, G.E. Grant, and L.M. Reid. 1987. Stream channels: the link between forests and fishes. In Streamside Management: Forestry and Fishery Interactions; E.O. Salo and T.W. Cundy, eds. Pgs. 191-232. Contribution 57, University of Washington, Institute of Forest Resources. Seattle, WA.

Swanson, F.J., and C.T. Dyrness. 1975. Impact of clear-cutting and road construction on soil erosion by landslides in the western Cascade Range, Oregon. Geology 3:393-396.

Swanston, D.N. and F.J. Swanson. 1976. Timber harvesting, mass erosion, and steepland forest geomorphology in the Pacific Northwest. In Geomorphology and Engineering; D.R. Coates, ed. Pgs. 199-221. Dowden, Hutchinson, and Ross. Stroudsburg, PA.

Swanston, D.N. 1991. Natural processes. In Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats; W.R. Meehan, ed. Pgs. 139-179. American Fisheries Society Special Pub. 19. Bethesda, MD.

Thomas, R.B. and W.F. Megahan. 1998. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon: A second opinion. Water Resources Research 34(12):3393-3403.

Van Sickle, J, and S.V. Gregory. 1990. Modeling inputs of large woody debris to streams from falling trees. Canadian Journal of Forest Research 20:1593-1601.

Wemple, B.C., J. A. Jones, and G.E. Grant. 1996. Channel network extension by logging roads in two basins, western Cascades, Oregon. Water Res. Bull. 32(6): 1-13.

Ziemer, R.R. 1981. Roots and stability of forested slopes. IAHS Publication 132:342-357.

# 5. APPENDICES

**Appendix A.** Proposed regeneration harvests in the Upper South Yamhill River 5th Field Watershed under Management Plan (2003-2012), associated streams, and relevant buffer information.

| | | | | | | Buffer Vegetation | | |
|---|---|---|---|---|---|---|---|---|
| Harvest Year | Stream/ Drainage | Stand Number | Stand Acres[1] | Distance to Steelhead (miles)[2] | Buffer (stream type)[3] | Tree Species[4] | Size Class (inches) | ~Trees per Acre |
| 2003 | Cosper | 57180148 | 33.21 | adjacent | 1, 3 | DF | 37610 | 150-349 |
| | Eads | 58070089 | 10.40 | 1.89 | 2, 3 | DF | 37610 | 150-349 |
| | Eads | 58170167 | 36.89 | 0.30 | 2 | DF | 37610 | 75-149 |
| | Eads | 58070082 | 16.46 | 1.89 | 2 | DF | 37610 | 150-349 |
| | W Fk Agency | same stand as above | | 0.25 | 3 | DF | 37610 | 150-349 |
| 2004 | Yoncalla | 58030279 | 20.93 | 0.81 | 2, 3 | DF | 12-21 & 22+ | 150-349 |
| | | 58030276 | 29.73 | 0.74 | 2, 3 | DF | 37610 | 75-349 |
| 2005 | W Fk Agency | 58080056 | 8.89 | adjacent | 1 | DF | 37610 | 150-349 |
| | | 58080110 | 5.15 | 0.35 | 3 | DF | 37427 | 75-349 |
| 2006 | Wind | 58140234 | 10.91 | adjacent | 1, 2 | DF | 37610 | 150-349 |
| | Cosper | 58130218 | 19.06 | adjacent | 2 | DF | 37610 | 75-149 |
| | | 57180147 | 15.24 | 0.29 | 3 | DF | 37610 | 150-349 |
| 2007 | Joe | 58130238 | 34.98 | 0.04 | 3 | DF | 37610 | 150-349 |
| | Yoncalla | 58030046 | 12.55 | 0.33 | 3 | DF | 37417 | 75-149 |
| 2008 | Cosper | 58120227 | 21.61 | adjacent | 1, 2, 3 | DF | 37610 | 150-349 |
| | | 58120247 | 7.97 | adjacent | 1 | DF | 37610 | 150-349 |
| | | 58120324 | 8.65 | adjacent | 1, 2, 3 | DF | 37610 | 150-349 |
| 2009 | Cosper | 57180240 | 28.59 | 0.35 | 2, 3 | DF | 37610 | 75-149 |
| | | 57180239 | 11.92 | 0.35 | 2, 3 | DF | 37610 | 75-149 |
| 2010 | Wind | 58110257 | 23.83 | 0.01 | 1, 3 | DF & RA | 37610 | 75-349 |
| | | 58140244 | 34.21 | 0.05 | 1, 2 | DF | 37610 | 150-349 |
| | Joe | same stand as above | | 0.37 | 3 | DF | 37610 | 75-149 |

| Harvest Year | Stream/ Drainage | Stand Number | Stand Acres[1] | Distance to Steelhead (miles)[2] | Buffer (stream type)[3] | Tree Species[4] | Size Class (inches) | ~Trees per Acre |
|---|---|---|---|---|---|---|---|---|
| 2011 | Yoncalla | 58150271 | 19.32 | 0.13 | 2, 3 | RA | 37610 | 75-149 |
| | Eads | 58170136 | 11.99 | 0.03 | 1, 2 | DF | 37610 | 150-349 |
| | Eads | 58170373 | 9.08 | adjacent | 1, 2 | DF | 37610 | 75-149 |
| 2012 | Yoncalla | 58150252 | 48.49 | 0.10 | 3 | DF | 37610 | 150-349 |
| | Wind | same stand as above | | 0.12 | 2, 3 | DF | 37610 | 150-349 |
| Totals | | | 490 | | | | | |

[1] The stand acres represent approximate size and location of areas to be harvested, not actual harvest unit layout.

[2] Distances to fishbearing and steelhead spawning waters were measured using a GIS and are approximate. Actual distances can vary depending on measurement method, changes in stream types, updates to spawning areas, and mapping errors.

[3] Stream type 1 is fishbearing, type 2 is perennial non-fishbearing, and type 3 is intermittent non-fishbearing. Stands adjacent to fish bearing streams will receive buffers following the buffer guidelines.

[4] DF indicates “Douglas fir” and RA indicates “red alder.”

**Appendix B.** Proposed regeneration harvests in the Willamina Creek 5th Field Watershed under Management Plan (2003-2012), associated streams, and relevant buffer information.

| Harvest Year | Stream/ Drainage | Stand Number | Stand Acres[1] | Distance to Steelhead (miles)[2] | Buffer (stream type)[3] | Buffer Vegetation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Tree Species[4] | Size Class (inches) | ~Trees per Acre |
| 2005 | Canada | 47300336 | 35.21 | adjacent | 1,2,3 | DF&RA | 37610 | 150-349 |
| 2012 | Burton | 47310017 | 3.72 | 1.38 | 3 | DF | 37417 | 75-149 |
| 2012 | Burton | 47310018 | 5.36 | 1.33 | 2 | DF | 37417 | 75-149 |
| Total | | | 44 | | | | | |

[1] The stand acres represent approximate size and location of areas to be harvested, not actual harvest unit layout.

[2] Distances to fishbearing and steelhead spawning waters were measured using a GIS and are approximate. Actual distances can vary depending on measurement method, changes in stream types, updates to spawning areas, and mapping errors.

[3] Stream type 1 is fishbearing, type 2 is perennial non-fishbearing, and type 3 is intermittent non-fishbearing. Stands adjacent to fish bearing streams will receive buffers following the buffer guidelines.

[4] DF indicates "Douglas fir" and RA indicates "red alder."

**Appendix C.** Proposed alternate sites for regeneration harvests under Management Plan (2003-2012), associated streams, and relevant buffer information.

| 5th Field Watershed | Stream/ Drainage | Stand Number | Stand Acres[1] | Distance to Steelhead (miles)[2] | Buffer (stream type)[3] | Buffer Vegetation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Tree Species[4] | Size Class (inches) | ~Trees per Acre |
| Up. S. Yamhill | Agency | 58170129 | 44.00 | 0.10 | 2, 3 | DF | 22+ | 75-149 |
| | Yoncalla | 58100348 | 59.00 | adjacent | 1, 2, 3 | DF & RA | 37610 | 75-349 |
| | Joe | 58110231 | 23.00 | 0.32 | 3 | DF | 37610 | 150-349 |
| | Wind | same stand as above | | 0.26 | 3 | DF | <5 | 500 |
| | Cosper | 58120232 | 47 | 0.05 | 3 | DF | 37610 | 150-349 |
| | Wind | same stand as above | | 0.44 | 3 | DF | 37610 | 75-149 |
| Totals | | | 173 | | | | | |

[1] The stand acres represent approximate size and location of areas to be harvested, not actual harvest unit layout.

[2] Distances to fishbearing and steelhead spawning waters were measured using a GIS and are approximate. Actual distances can vary depending on measurement method, changes in stream types, updates to spawning areas, and mapping errors.

[3] Stream type 1 is fishbearing, type 2 is perennial non-fishbearing, and type 3 is intermittent non-fishbearing. Stands adjacent to fish bearing streams will receive buffers following the buffer guidelines.

[4] DF indicates "Douglas fir" and RA indicates "red alder."